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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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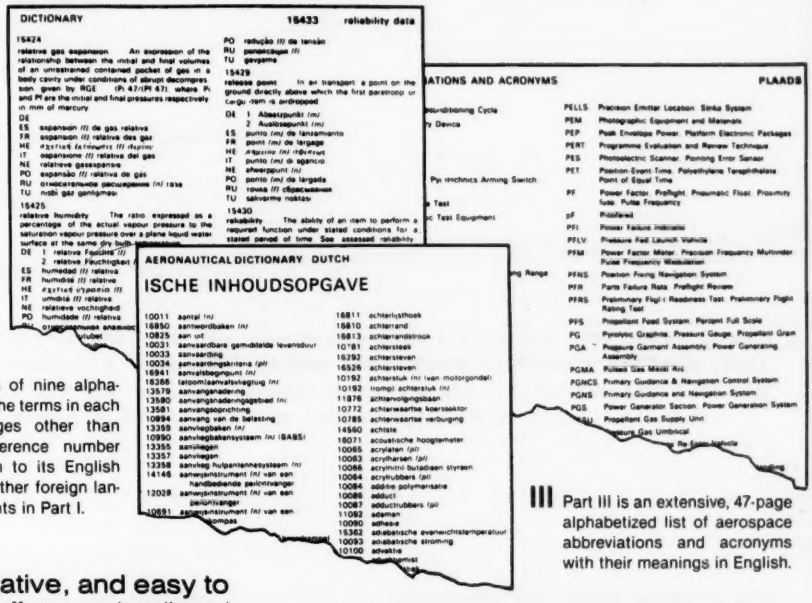
DICTIONARY
15433 reliability data
15424
relative gas expansion An expression of the relationship between the initial and final volumes of an unrestrained contained packet of gas in a body cavity under conditions of abrupt decompression given by RGE (P1 47/(P1 47) where P1 and Pf are the initial and final pressures respectively in mm of mercury
15425
relative humidity The ratio expressed as a percentage of the actual vapour pressure to the saturation vapour pressure over a plane liquid water surface at the same dry bulb
15429
release point In air transport a point on the ground directly above which the first parachute or cargo item is dropped
15430
reliability The ability of an item to perform a required function under stated conditions for a stated period of time. See assessed reliability
AERONAUTICAL DICTIONARY DUTCH
ISCHE INHOUDSOPGAVE
PLAADS
PELLS Precision Emitter Location Strike System
PEM Photographic Equipment and Materials
PEP Peak Envelope Power. Platform Electronic Packages
PERT Programme Evaluation and Review Technique
PES Photoelectric Scanner. Pointing Error Sensor
PET Position Event Time. Polyethylene Terephthalate Point of Equal Time
PF Power Factor. Preflight. Pneumatic Float. Proximity fuse. Pulse Frequency
pF Picofarad
PFI Power Failure Indicator
PFLV Pressure Fed Launch Vehicle
PFM Power Factor Meter. Precision Frequency Multimeter Pulse Frequency Modulation
PFNS Position Fixing Navigation System
PFR Parts Failure Rate. Preflight Review
PFRS Preliminary Flight Readiness Test. Preliminary Flight Rating Test
PFS Propellant Feed System. Percent Full Scale
PG Pyrolytic Graphite. Pressure Gauge. Propellant Grain
PGA Pressure Garment Assembly. Power Generating Assembly
PGMA Pulsed Gas Metal Arc
PGNCS Primary Guidance & Navigation Control System
PGNS Primary Guidance and Navigation System
PGS Power Generator Section. Power Generation System
PGU Propellant Gas Supply Unit

I Part I, the heart of the dictionary, is an alphabetical listing of over 7000 aeronautical terms. The terms are identified by a reference number, precisely defined in English, and followed by equivalent terms in the nine other languages.

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

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48 OCEANOGRAPHY **571**
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) **572**
Includes genetics.

52 AEROSPACE MEDICINE **576**
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES **578**
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT **578**
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY **N.A.**
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **N.A.**

60 COMPUTER OPERATIONS AND HARDWARE **579**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **581**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS **584**
Includes computer networks.

63 CYBERNETICS **585**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **585**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **590**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **592**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **592**
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) **593**
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS **593**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **594**
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **598**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **599**
Includes light phenomena.

75 PLASMA PHYSICS **600**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **602**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **604**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **604**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **605**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **N.A.**
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **606**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **606**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **606**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **607**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **608**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **609**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **610**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **611**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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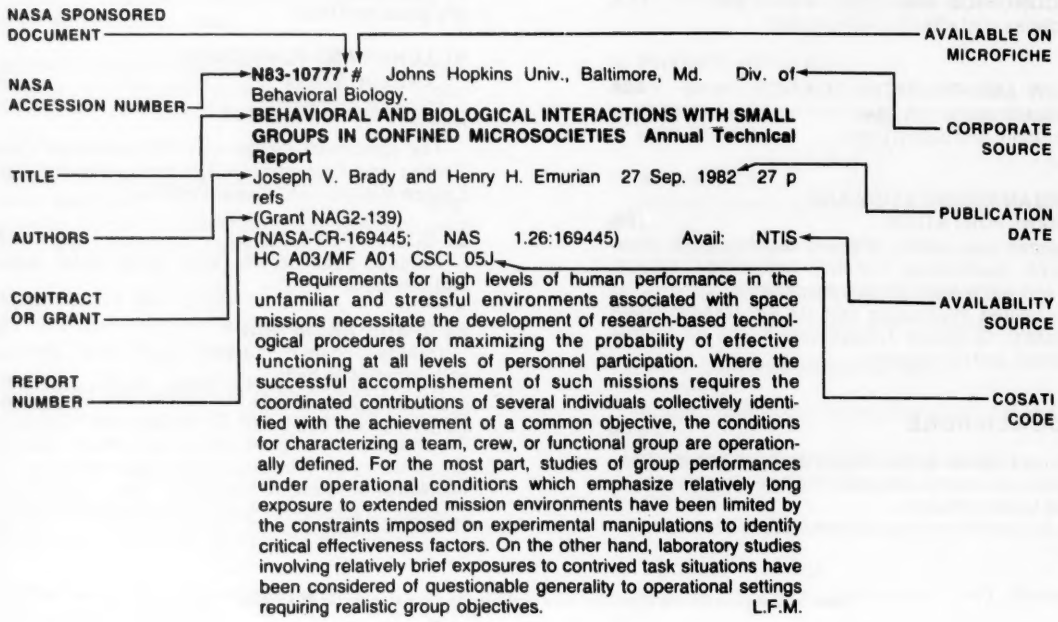
TYPICAL CITATION AND ABSTRACT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N83-10777*# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAG2-139)
REPORT NUMBER
(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS
AVAILABILITY SOURCE
HC A03/MF A01 CSCL 05J
COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 4/FEBRUARY 23, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-13059*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICS RESEARCH AND TECHNOLOGY PROGRAM AND SPECIFIC OBJECTIVES
[1981] 189 p
(NASA-TM-85163; NAS 1.15:85163) Avail: NTIS HC A09/MF A01 CSCL 01B

Aeronautics research and technology program objectives in fluid and thermal physics, materials and structures, controls and guidance, human factors, multidisciplinary activities, computer science and applications, propulsion, rotorcraft, high speed aircraft, subsonic aircraft, and rotorcraft and high speed aircraft systems technology are addressed. N.W.

N83-13060# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION, NO. 98
22 Oct. 1982 96 p Transl. into ENGLISH from various Russian articles
(JPRS-82053) Avail: NTIS HC A05

Advances in air, rail, motor vehicle and marine transportation are reported. The construction, repair and efficiency of transportation systems are discussed. For individual titles, see N83-13061 through N83-13064.

N83-13061# Joint Publications Research Service, Arlington, Va.
FLIGHT PERSONNEL COMMENT ON EXPERIENCE FLYING NEW YAK-42 **c05**
In its USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 7-11 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 7, Jul. 1982 p 18-19 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

The flight performance of the Yak-42 aircraft is described. The new Yak-42 passenger plane has been used for almost two years on Aeroflot lines. This 120-passenger liner was developed at the design bureau of Twice Hero of Socialist Labor A. S. Yakovlev. It is designed for flights on short trunk routes and for local air routes. The new Aeroflot plane flies from Moscow to Donetsk, Zhdanov, Izhevsk, Krasnodar, Nalchik, Kherson, and a number of other cities. In addition it serves the overseas lines from Leningrad to Helsinki, from Leningrad to Tampere, and from Kiev to Prague. B.W.

N83-13062# Joint Publications Research Service, Arlington, Va.
MINISTER REVIEWS PLANS FOR RAISING EFFICIENCY OF CIVIL AVIATION
I. Ye. Mashkivskiy *In its* USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 12-17 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 8, Aug. 1982 p 14-15 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

Efforts to raise the efficiency and quality of work by the civil aviation sector are discussed. This means that the efforts of employees should be aimed at broad introduction of scientific-technical advances, at rational, truly proprietary use of production potential, and at all possible economies of means. The principal challenge that follows from the policy of raising production efficiency may be formulated as follows: The final results of the work must grow faster than expenditures for it. The material base which makes it possible to meet the needs of the economy and the population for air transport is the fixed capital of the sector. The fleet of aircraft is its principal component. Already today it constitutes more than half of all fixed productive capital. That is why significant reserves for raising the efficiency and quality of all work are concealed in rational use of airplanes and helicopters. B.W.

N83-13063# Joint Publications Research Service, Arlington, Va.
CONSERVING AVIATION FUEL BY SHIFTING CENTER-OF-GRAVITY POSITION **c05**
S. Skripnichenko and A. Fedchenko *In its* USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 18-23 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 8, Aug. 1982 p 26-27 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

One of the reserves for conserving fuel is reducing fuel expenditure by introducing the recommendations on the influence of balancing on the aerodynamic efficiency (lift-to-drag ratio) of aircraft developed by GosNII GA together with organizations of the Ministry of Aviation Industry. It is common knowledge that in a cruising regime air dynamic efficiency determines the magnitude of fuel expenditure. This is easy to ascertain because perkilometer fuel expenditure (qkm) is inversely propertional to aerodynamic efficiency (K): qkm = CeG/KV where Ce is specific fuel expenditure, G is the flying weight of the aircraft, and V is the air speed of flight. Aerodynamic efficiency itself is the ratio of the airplane's lift (Y) to the force of drag (X) or the ratio of their coefficients (K = Cy/Cx). At set flying altitude and speed the coefficient of lift is proportional to flying weight. But the coefficient of drag (for a given value of the lift coefficient) depends on deflection of the stabilizer and elevator. The greater these deflections, the greater the drag coefficient will be, which also means the greater fuel expenditure will be. Author

N83-13064# Joint Publications Research Service, Arlington, Va.
AVIATION REPAIR ASSOCIATION CHIEF INTERVIEWED
M. Gasanaliyev *In its* USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 24-27 Transl. into ENGLISH from Vozdushnny Transport (Moscow), 17 Jul. 1982 p 2 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

The repair of aviation equipment is discussed in detail. Productivity, labor and cost effectiveness are investigated. B.W.

N83-13065*# Sikorsky Aircraft, Stratford, Conn.
PREDESIGN STUDY FOR A MODERN 4-BLADED ROTOR FOR RSRA Final Report

S. Jon Davis Mar. 1981 176 p refs
(Contract NAS2-10691)
(NASA-CR-166155; NAS 1.26:166155) Avail: NTIS HC A09/MF A01 CSCL 01C

The feasibility of providing a modern four-bladed rotor for flight research testing on a rotor system aircraft was evaluated. The capabilities of a state of the art rotor system and the contributions of key design parameters to these capabilities were investigated. Three candidate rotors were examined: the UH-60A BLACK HAWK rotor with and without root extenders and the H-3 composite blade rotor. It was concluded that the technical/cost objectives could best be accomplished using the basic BLACK HAWK rotor (i.e. without root extenders). Further, the availability of three existing sets of blade tip of varying design, together with a demonstrated capability for altering airfoil geometry should provide early research information on important design variables at reduced cost. S.L.

N83-13066# Air Force Academy, Colo.
AIR FORCE ACADEMY AERONAUTICS DIGEST, FALL/WINTER, 1981 Final Report
A. M. Higgins, James M. Kempf, E. J. Jumper, Jay DeJongh, and Karyn Knoll Jun. 1982 163 p refs
(AD-A119168; USAFA-TR-82-3) Avail: NTIS HC A08/MF A01 CSCL 20/4

The lifting surface wakes of a conard and forward swept wing configuration are discussed. Flow field measurements of three dimensional square cross section missiles at moderate angles of attack are presented. The frequency response characteristics of a redesigned seven hole pressure probe are also discussed. S.F.

N83-13067# Federal Aviation Administration, Washington, D.C. Office of Management Systems.
CENSUS OF U.S. CIVIL AIRCRAFT, CALENDAR YEAR 1981 Annual Report
31 Dec. 1981 315 p
(AD-A119358; FAA-AMS-220) Avail: NTIS HC A14/MF A01 CSCL 01/3

This report presents information about the U.S. civil aircraft fleet. It includes detailed tables of air carrier aircraft and an inventory of registered aircraft by manufacturer and model, and general aviation aircraft by state and county of the owner.
Author (GRA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-13068 Rensselaer Polytechnic Inst., Troy, N. Y.
PASSIVE SHOCK WAVE/BOUNDARY LAYER CONTROL FOR TRANSONIC SUPERCRITICAL AIRFOIL DRAG REDUCTION Ph.D. Thesis
Lakhdar Bahi 1982 205 p
Avail: Univ. Microfilms Order No. DA8223311

An investigation of the passive shock wave/boundary layer interaction control aiming at reducing the drag for conventional and supercritical airfoils at transonic Mach numbers is presented. A 3x 15.4-inch Transonic Wind Tunnel was designed, constructed and calibrated to achieve this objective. Modifications were made in the initial constant area test section to accommodate for the boundary layer growth along the tunnel walls. The passive drag control concept, consisting of a porous surface with a cavity beneath it, was investigated with a 12 percent thick circular arc and a 14 percent thick supercritical airfoil mounted on the test section bottom wall. The porous surface was positioned in the shock wave/boundary layer interaction region. The flow circulating through the porous surface, from the downstream to the upstream of the termination shock wave location, produced a lambda shock wave system and a pressure decrease in the downstream region minimizing the flow separation. The wake impact pressure data showed an appreciably drag reduction with the porous surface at transonic speeds. Dissert. Abstr.

N83-13069 Stanford Univ., Calif.
A STUDY OF THE ACOUSTIC AND FLOW FIELDS OF A RECTANGULAR WALL JET Ph.D. Thesis
William Clifton Horne 1982 121 p
Avail: Univ. Microfilms Order No. DA8220474

Wall jet tones, which are observed when a rectangular jet flows over a wall of moderate length, were experimentally and analytically investigated. The nature of the acoustic and flow fields, and the effects of the important experimental parameters such as jet speed, wall length, and trailing edge angle on the wall tone were observed. The acoustic field was surveyed with polar microphone traverse to determine the directivity pattern and radial variation of sound pressure. The flow field was studied with Schlieren flow visualization and hot wire surveys. Measurements of small velocity disturbances were compared with previous predictions of the stability characteristics of a parallel wall jet shear flow. The flow visualization program revealed the existence of an extensive convecting vortex array in the edge region during tone generation. The analytical investigation addressed the question of stability of an array of ideal vortices in an inviscid, incompressible fluid near an infinite wall. This analysis predicted stable behavior for vortex array configurations which resembled the structure resolved by the flow visualization studies. Dissert. Abstr.

N83-13070*# Bihrle Applied Research, Inc., Jericho, N. Y.
ROTARY BALANCE DATA FOR A TYPICAL SINGLE-ENGINE GENERAL AVIATION DESIGN FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG. 2: INFLUENCE OF HORIZONTAL TAIL LOCATION FOR MODEL D
Billy Barnhart Washington NASA Nov. 1982 424 p refs
(Contract NAS1-16205)
(NASA-CR-3247; NAS 1.26:3247) Avail: NTIS HC A18/MF A01 CSCL 01A

The influence of horizontal tail location on the rotational flow aerodynamics is discussed for a 1/6-scale general aviation airplane model. The model was tested using various horizontal tail positions, with both a high and a low-wing location and for each of two body lengths. Data were measured, using a rotary balance, over an angle-of-attack range of 8 to 90 deg, and for clockwise and counter-clockwise rotations covering an Omega b/2V range of 0 to 0.9. M.G.

N83-13071*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
ANALYSIS OF A FINITE DIFFERENCE GRID Final Technical Report, 10 Aug. 1981 - 10 Feb. 1982
Goetz H. Klopfer Moffett Field, Calif. NASA. Ames Research Center Dec. 1982 63 p refs
(Contract NAS2-11063)
(NASA-CR-166421; NAS 1.26:166421; TR-267) Avail: NTIS HC A04/MF A01 CSCL 01A

Some means of assessing the suitability of a mesh network for a finite difference calculation are investigated in this study. This has been done by a study of the nonlinear truncation errors of the scheme. It turns out that the mesh can not be properly assessed a priori. The effect of the mesh on the numerical solution depends on several factors including the mesh itself, the numerical algorithm, and the solution. Several recommendations are made with regard to generating the mesh and to assessing its suitability for a particular numerical calculation. Author

N83-13072*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
AN ANALYSIS OF AERODYNAMIC REQUIREMENTS FOR COORDINATED BANK-TO-TURN AUTOPILOTS Final Report
A. Arrow Washington NASA Nov. 1982 304 p refs Sponsored by NASA

(NASA-CR-3644; NAS 1.26:3644) Avail: NTIS HC A14/MF A01 CSCL 01C

Two planar missile airframes were compared having the potential for improved bank-to-turn control but having different aerodynamic properties. The comparison was made with advanced level autopilots using both linear and nonlinear 3-D aerodynamic models to obtain realistic missile body angular rates and control surface incidence. Cortical cross-coupling effects are identified and desirable aerodynamics are recommended for improved coordinated (BTT) (CBTT) performance. In addition, recommendations are made for autopilot control law analyses and design techniques for improving CBTT performance. Author

N83-13073*# Boeing Commercial Airplane Co., Seattle, Wash.
STUDY OF SUPERSONIC WINGS EMPLOYING THE ATTAINABLE LEADING-EDGE THRUST CONCEPT Final Report, Dec. 1980 - Apr. 1982
W. D. Middleton Washington NASA Nov. 1982 159 p refs (Contract NAS1-15534)
(NASA-CR-3637; NAS 1.26:3637) Avail: NTIS HC A08/MF A01 CSCL 01A

A theoretical study was made of supersonic wing geometries at Mach 1.8, using the attainable leading-edge thrust concept. The attainable thrust method offers a powerful means to improve overall aerodynamic efficiency by identifying wing leading-edge geometries that promote attached flow and by defining a local angle-of-attack range over which attached flow may be obtained. The concept applies to flat and to cambered wings, which leads to the consideration of drooped-wing leading edges for attached flow at high lift coefficients. Author

N83-13074# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
PROPULSIVE PERFORMANCE OF 2-DIMENSIONAL THIN AIRFOILS UNDERGOING LARGE-AMPLITUDE PITCH AND PLUNGE OSCILLATIONS M.S. Thesis
James D. Fairgrieve and James D. DeLaurier Jul. 1982 130 p refs
(UTIAS-TN-226; ISSN-0082-5263) Avail: NTIS HC A07/MF A01

Three discrete-wake-vortex models were developed and applied to various pitch and plunge combinations for arbitrary motion in an inviscid fluid. The simplest model assumes that the shed vortex wake is planar, while the remaining two models allow for a two dimensional or "wavy" wake: one traced and "frozen" in space, and the other allowing the shed vortex sheet to interact with itself and the airfoil's bound vortices. Periodic, but not necessarily harmonic, motions are considered and propulsive performance measures, such as average propulsive efficiency and average thrust coefficient, are calculated. The results show that pitch articulation, in combination with plunging motion, can increase either average propulsive efficiency or average thrust coefficient, but not necessarily both simultaneously. It was also found that a modified square-wave-type motion generally gives rise to relatively high values of average thrust. These high thrust values are obtained at the expense of excessively large relative angles of attack at certain portions of the cycle. Author

N83-13075*# Spectron Development Labs., Inc., Costa Mesa, Calif.
A STUDY OF MODEL DEFLECTION MEASUREMENT TECHNIQUES APPLICABLE WITHIN THE NATIONAL TRANSONIC FACILITY
B. P. Hildebrand and J. L. Doty Feb. 1982 104 p refs (Contract NAS1-16564)
(NASA-CR-165853; NAS 1.26:166853) Avail: NTIS HC A06/MF A01 CSCL 01A

Moire contouring, scanning interferometry, and holographic contouring were examined to determine their practicality and potential to meet performance requirements for a model deflection sensor. The system envisioned is to be nonintrusive, and is to be capable of mapping or contouring the surface of a 1-meter by 1-meter model with a resolution of 50 to 100 points. The available literature was surveyed, and computations and analyses were performed to establish specific performance requirements, as well as the capabilities and limitations of such a sensor within the geometry of the NTF section test section. Of the three systems examined, holographic contouring offers the most promise. Unlike Moire, it is not hampered by limited contour spacing and extraneous fringes. Its transverse resolution can far exceed the limited point sampling resolution of scanning heterodyne interferometry. The availability of the ruby laser as a high power, pulsed, multiple wavelength source makes such a system feasible within the NTF. A.R.H.

N83-13076*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
STUDY OF HIGHLY SWEPTBACK WINGS BY THE FREE VORTEX SHEET METHOD Final Report, period ending 15 Aug. 1982
S. K. Chaturvedi and Farhad Ghaffari Oct. 1982 43 p refs (Grant NsG-1561)
(NASA-CR-169559; NAS 1.26:169559) Avail: NTIS HC A03/MF A01 CSCL 01A

The aerodynamic characteristics of highly sweptback wings with separations induced vortex flows have been numerically investigated using the free vortex sheet method, developed by Boeing Company, under a contract with NASA/Langley Research Center. The models studied included delta and straked wings, and wings with leading edge extensions. Also, PAN-AIR code has been used to design a fixed leading edge extension into a thick delta wing. The theoretical results predicted have been compared with the experimental data wherever available, and the code capabilities and limitations explored. New fuselage effects also have been considered in some cases. Author

N83-13077*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A RAPID BLADE-TO-BLADE SOLUTION FOR USE IN TURBOMACHINERY DESIGN
Eric R. McFarland 1982 13 p refs Proposed for presentation at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983; sponsored by ASME
(NASA-TM-83010; E-1445; NAS 1.15:83010) Avail: NTIS HC A02/MF A01 CSCL 01A

A rapid technique for solving the blade-to-blade turbomachinery flow problem was developed. Approximate governing flow equations, which include the effects of compressibility, radius change, rotation, and variable stream sheet thickness are solved using a panel method. The development and solution of these equations are described. Sample calculations are presented to illustrate the method's capabilities and accuracy. Author

N83-13078# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Experimentelle Aerodynamik.
DESIGN AND MANUFACTURE OF A TRANSONIC WIND TUNNEL MODEL AND THE INVESTIGATION OF MODEL COMPONENTS UNDER CRYOGENIC FLOW CONDITIONS IN THE EUROPEAN TRANSONIC WIND TUNNEL Final Report, Sep. 1981
Rudolf Leistner, Athanassios Zacharias, Dieter Schimanski, Peter Esch (Dornier-Werke GmbH, Friedrichshafen, West Germany), Roland Joos (Dornier-Werke GmbH, Friedrichshafen, West Germany), and Ernstfried Thiel (Dornier-Werke GmbH, Friedrichshafen, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 113 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-015; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24

A tornado model wing with high lift devices, which demonstrates that models which exhibit the critical aerodynamic characteristics for a design Reynolds number of 40 million can be built for the European wind tunnel, is presented. Stress, design life, safety factors, and mechanical and physical properties of design elements are discussed. Test data for maraging and austenitic steel elements are presented. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-13079 Colorado Univ., Boulder.
PILOT-IN-COMMAND: A SOCIOLOGICAL ANALYSIS OF GENERAL AVIATION ACCIDENTS Ph.D. Thesis
Ronald Frank Urban 1982 423 p
Avail: Univ. Microfilms Order No. DA8221131

Employing a quasi-experimental design, this investigation represents an exploratory examination of several differentiating social and demographic characteristics of a sample of calendar year 1978 Colorado-resident nonfatal accident-involved pilots and a random sample of nonaccident general aviation (i.e., non-airline) pilots. Eighty currently-active pilots were interviewed by the author during 1979-80, and information concerning the standard demographic variables in addition to several social psychological and flying-related items was obtained. The sample was generated from commercially available data files derived from U.S. Government records and consisted of forty-six accident and thirty-four nonaccident pilots who resided within a one-hundred-mile radius of Denver, east of the Rocky Mountains. Application of stepwise discriminant analysis revealed that the pilots' education, political orientation, birth order, percent of flying for business purposes, participation in nonflying aviation activities, number of years of flying experience, and an index of aviation procedural noncompliance yielded statistically significantly results. Dissert. Abstr.

N83-13080# National Transportation Safety Board, Washington, D. C.
NATIONAL TRANSPORTATION SAFETY Annual Report to Congress, 1981
30 Mar. 1982 85 p refs
Avail: NTIS HC A05/MF A01; HC also available from SOD

National transportation safety during the year 1981 is discussed. For individual titles, see N83-13081.

N83-13081# National Transportation Safety Board, Washington, D. C.
AVIATION SAFETY
In its Natl. Transportation Safety 30 Mar. 1982 p 9-24 (For primary document see N83-13080 04-03)
Avail: NTIS HC A05/MF A01; HC also available from SOD

Aviation safety during 1981 is reviewed. The 1981 accident rate per 100,000 hours flown is charted. The effect of the air traffic controllers' strike on the safe operation of the air traffic control system is evaluated. Efforts to improve aircraft crashworthiness are described. The causes of specific accidents involving air traffic control, commuter airlines, weather detection, icing, air turbulence, corporate aircraft, crew or pilot error, helicopters, locator beacons, and others are described. J.D.

N83-13082# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AVIATION ACCIDENT REPORT: TRAIN AIR, INCORPORATED, GATES LEARJET 24, N44CJ, FELT, OKLAHOMA, 1 OCTOBER 1981
18 May 1982 54 p refs
(PB82-910404; NSTB-AAR-82-4) Avail: NTIS HC A04/MF A01 CSCL 01C

The probable cause of the accident was a loss of control, possibly initiated by an unexpected encounter with moderate to severe clear air turbulence, which caused the aircraft to depart the narrow flight envelope boundaries in which it was operating and from which recovery was not effected, the flightcrew's lack of adequate training and experience in the Learjet, and the aircraft's marginal controllability characteristics near and beyond the boundaries of its flight envelope. Contributing to the accident was the flightcrew's probable extension of the spoilers in an overspeed situation, a procedure that had been prescribed in the approved aircraft flight manual until 1 year before the accident. S.L.

N83-13083# Coast Guard, Washington, D.C. Office of Merchant Marine Safety.
FIELD TEST OF LIFEJACKET FLOTATION MATERIALS Final Report
Samuel E. Wehr and Timothy R. Girton Jul. 1982 53 p refs
(AD-A119344; USCG-M-82-2(16174)) Avail: NTIS HC A04/MF A01 CSCL 06/7

This report represents the results and analysis of a field test program for personal flotation device (PFD) flotation materials. The field test was conducted at several boat and canoe liveries throughout the Eastern United States. The test was intended to determine if significant losses of buoyancy occur among various flotation materials when subjected to 'field use' environments and if so, to determine if the deteriorization process can be simulated in laboratory environment. Author (GRA)

N83-13084# Civil Aeronautics Board, Washington, D.C. Financial Section.
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS Annual Report for 1981
31 Dec. 1981 347 p Prepared in cooperation with FAA, Washington
(AD-A119713) Avail: NTIS HC A15/MF A01 CSCL 01/2

This report furnishes airport activity of the Certificated Route Air Carriers. Included in the data contained in Table 6 are passenger enplanements, tons of enplaned freight, express, and mail. Both scheduled and non-scheduled service, and domestic and international operations are included. These data are shown by airport and carrier. Table 7 includes departures by airport, carrier and type of operation, and type of aircraft. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-13085# Reder Consulting, Inc., Long Branch, N.J.
PROCEEDINGS OF THE OMEGA WORKSHOP
Fritz Reder and John Williamson (FAA) 1982 262 p Workshop held in Atlantic City, 11-13 May 1982; sponsored by FAA, International Omega Association, Maritime Inst. of Technology and Graduate Studies and US Coast Guard
(Contract DTFA03-82-C-00017)
Avail: NTIS HC A12/MF A01

The problems affecting Omega safety, reliability, accuracy, and ease of operation are discussed. Transmitter synchronization, Omega coverage due to modal interference and GDOP, and an increase of Omega coverage by long path signal use are considered. S.L.

N83-13086# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MODE S BEACON SYSTEM: FUNCTIONAL DESCRIPTION
V. A. Orlando and P. R. Drouilhet 27 Oct. 1982 100 p refs
(Contracts DOT-FA72WAI-261; F19628-80-C-0002; FAA Proj. 052-241-04)
(ATC-42-Rev-B; FAA-RD-82-52) Avail: NTIS HC A05/MF A01

A functional description is provided for the Mode S Beacon System, a combined secondary surveillance radar (beacon) and ground-air-ground data link system capable of providing the aircraft surveillance and communications necessary to support ATC automation in future traffic environments. Mode S is capable of common-channel interoperation with the current ATC beacon system, and may be implemented at low user cost over an extended

transition period. Mode S will provide the surveillance and communication performance required by ATC automation, the reliable communications needed to support data link services, and the capability of operating with a terminal or enroute, radar digitizer-equipped, ATC surveillance radar. Author

N83-13087# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
INSTRUMENT LANDING SYSTEM LOCALIZER VECTOR FAR FIELD MONITOR DEVELOPMENT Final Report, Oct. 1980 - Jul. 1982
O. A. Baughman and R. A. Rajnic Washington FAA Jul. 1982 148 p refs
(Contract DTFA01-80-C-10134)
(FAA-RD-82-62) Avail: NTIS HC A07/MF A01

Design, development and results of testing of the prototype Vector Far Field Monitor (VFFM) equipment are discussed. The VFFM is a localizer monitor located in the runway approach area on the runway centerline extended between the threshold and the middle marker vicinity. It measures the in-phase and quadrature components of the scattered and reflected localizer sideband radiation on the localizer course and calculates the potential maximum course DDM disturbance using synchronous and single point detection techniques. Localizer transmitter incidential phase modulation or quadrature modulation effect on the VFFM is dealt with through a provision for a variable adjustment in the VFFM to tune out the corresponding quadrature component of the signal. Theory, equipment description, including installation and operating instructions, assembly drawings, and circuit schematics, summaries of field test data, and recommendations are included. Author

N83-13088# Lincoln Lab., Mass. Inst. of Tech., Lexington.
GENERATION OF THE MODE SELECT SENSOR NETWORK COVERAGE MAP
David Reiner 24 Nov. 1982 61 p refs
(Contracts DOT-FA72WAI-261; F19628-80-C-0002; FAA Proj. 052-241-04)
(ATC-98A; FAA-RD-82-37) Avail: NTIS HC A04/MF A01

This paper describes the technique of designing the network management coverage map files necessary to coordinate a network of Mode S sensors. First, the concept of the Mode S network is defined, and the functions of Network Management are briefly described, as they relate to the coverage map. Then, the rationale for the coverage map is given together with definitions of the map structure and the information required in the file. Implementation of these definitions is illustrated in terms of a specific example: a network of four Mode S sensors in the Washington, D.C. area. As configured, each of the sensors provides service to only one of four ATC facilities (three TRACONs and one ARTCC). The resulting map generation process illustrates not only the general principles but also the significant effects of the ATC control area geometry. Finally, the procedure required for automated map generation is defined. This procedure assumes the use of an interactive computer display terminal and is applicable to any sensor network and ATC facility configuration. Author

N83-13089# National Telecommunications and Information Administration, Boulder, Colo. Institute for Telecommunication Sciences.
INSTRUMENT LANDING SYSTEM LOCALIZER RECEIVER PERFORMANCE IN THE PRESENCE OF CO-CHANNEL INTERFERENCE Final Report
Eldon J. Haakinson Jul. 1982 51 p
(Contract DT-FA01-81-Y-10534)
(AD-A118909; DOT/FAA/RD-82/43) Avail: NTIS HC A04/MF A01 CSCL 17/7

Co-channel signals can cause harmful interference to navigational aid systems such as the Instrument Landing System. This report describes the performance of four localizer receivers in the presence of interference from co-channel CW (Continuous Wave), PSK (Phase Shift Keying), FSK (Frequency Shift Keying), and FM (Frequency Modulation) signals. The receiver parameters monitored during the measurements were course deviation voltage, warning flag voltage, AGC (Automatic Gain Control) voltage, and audio distortion. Measurement results are reported as the minimum signal-to-interference ratio required to keep each monitored parameter from exceeding specified bounds. Course deviation voltage is the most sensitive parameter to the co-channel interference. GRA

N83-13090# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN IMPROVED TECHNIQUE FOR ALTITUDE TRACKING OF AIRCRAFT
J. W. Andrews 25 Mar. 1981 62 p
(Contracts F19628-80-C-0002; DOT-FA77WAI-817)
(AD-A118899; ATC-105; FAA-RD-82-14) Avail: NTIS HC A04/MF A01 CSCL 17/7

When simple linear recursive tracking techniques are applied to quantized altitude reports, certain errors in estimation of altitude and altitude rate can be attributed to the response of the tracker to transitions between quantization levels. These errors can be reduced by use of an estimation technique which explicitly recognizes the quantized nature of the inputs. Smoothing of the level occupancy time (i.e., the time spent at each quantization level) can be used to control the response to redundant samples taken at the same quantization level. Further improvement is achieved by consistency tests which use particular properties of quantized data to detect changes in rate. This document presents a theoretical analysis of tracker response to quantized inputs. A tracking algorithm is synthesized using these techniques and simulation results using various altitude profiles are presented. Author (GRA)

N83-13091# Air Force Academy, Colo. Research Lab.
AN INVESTIGATION OF THE DYNAMIC RESPONSE OF A SEISMICALLY STABLE PLATFORM Final Report, Mar. 1980 - Sep. 1981
Bill J. Simmons, Francis S. Heming, Jr., and Felix E. Morgan Aug. 1982 80 p refs
(AF Proj. 2304)
(AD-A119342; FJSRL-TR-82-0007) Avail: NTIS HC A05/MF A01 CSCL 17/7

A sub-seismically quiet test platform is currently in development at Holloman AFB, NM. Support to this effort includes structural analyses toward design of a platform which has no structural resonances which affect the active servo frequency band. This report describes the analyses performed to establish credibility of methodology by comparison of experimental test analysis and theoretical analysis of structures. Following technique verification, an experimental analysis of Holloman's prototype platform was conducted and results compared to a theoretical analysis. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-13092 Sikorsky Aircraft, Stratford, Conn.
STRUCTURAL DEMONSTRATION OF THE SH-60B HELICOPTER, APPENDIX 1 AND 2 Report, 7 Jul. - 27 Jul. 1981
F. Marshall and W. Erison 15 Dec. 1981 1015 p refs
(Contract N00019-77-C-0202)
(SER-520235; LPL-NAV-82-2817) Avail: Issuing Activity

The SH-60B structural demonstration flight test program was successfully conducted on the Seahawk helicopter. The test program consisted of ten data flights, resulting in forty-three 'end point' maneuvers. Inclusive were twenty-nine 'up and away' maneuvers (i.e., symmetrical pullouts, pushovers, autorotative pullouts, etc.), and fourteen hard landing maneuvers. The hard landing 'end points' were achieved from a total of forty-eight hard landings, consisting of: five full autorotations, twenty-five landings on a nine degree slope, and eighteen landings on a flat surface.

Five of the landings exceeded the design limit of twelve fps, with a maximum of over thirteen fps developed at touchdown, during the run-on landings. S.L.

N83-13093# Association Aeronautique et Astronautique de France, Paris.
TRIDIMENSIONAL COMPUTATION OF THE FLOW IN HELICOPTER AIR INTAKES
B. Boizard Nov. 1981 18 p refs In FRENCH; ENGLISH summary Presented at the 18th Colloq. d'Aerodyn. Appl., Poitiers, France, 18-20 Nov. 1981 Previously announced as A82-19740
(PB82-204512; AAAF-NT-81-01; ISSN-0243-0177) Avail: NTIS HC A02/MF A01 CSCL 01C

Efficient air intake in the helicopter was studied. A tridimensional code based on the singularity method was developed. This code was to compute the flow in the air intake of two helicopters. The first results were flow pictures taken from the water tunnel are presented. GRA

N83-13094# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Transport- und Verkehrsflugzeuge.
CIVIL COMPONENT PROGRAM INTEGRATED-PROPULSION SYSTEM (IFAS) Final Report, Jul. 1981
Jochen Scheerer Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 39 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-017; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,50

A wind-tunnel test program on wing-body fairing and high lift systems for the European Airbus is presented. Simulation of turbine blade effects in transonic flight, modification of the tail-body configuration, structural stability, and simulation of thrust are discussed. Author (ESA)

N83-13061# Joint Publications Research Service, Arlington, Va.
FLIGHT PERSONNEL COMMENT ON EXPERIENCE FLYING NEW YAK-42
In its USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 7-11 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 7, Jul. 1982 p 18-19 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

N83-13063# Joint Publications Research Service, Arlington, Va.
CONSERVING AVIATION FUEL BY SHIFTING CENTER-OF-GRAVITY POSITION
S. Skripnichenko and A. Fedchenko *In its* USSR Rept.: Transportation, No. 98 (JPRS-82053) 22 Oct. 1982 p 18-23 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 8, Aug. 1982 p 26-27 (For primary document see N83-13060 04-01)
Copyright. Avail: NTIS HC A05

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-13095*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
REAL-TIME DATA DISPLAY FOR AFTI/F-16 FLIGHT TESTING
Paul F. Harney Nov. 1982 16 p refs
(NASA-TM-84899; NAS 1.15:84899) Avail: NTIS HC A02/MF A01 CSCL 01D

Advanced fighter technologies to improve air to air and air to surface weapon delivery and survivability is demonstrated. Real time monitoring of aircraft operation during flight testing is necessary not only for safety considerations but also for preliminary evaluation of flight test results. The complexity of the AFTI/F-16 aircraft requires an extensive capability to accomplish real time data goals; that capability and the resultant product are described. S.L.

N83-13096# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
FLIGHT TEST INSTRUMENTATION FOR AIRLINE DIGITAL AVIONICS
F. J. Abbink 19 May 1981 53 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentaion, Delft, Netherlands, May 1981
(NLR-MP-81017-U) Avail: NTIS HC A04/MF A01

The functions and the operation of airline avionics systems, and their flight testing objectives and requirements are discussed. Data acquisition equipment developed for the evaluation and certification of a civil transport aircraft prototype is described. For the determination of flight path during automatic approaches and landings, an integrated system based on inertial positioning, radio altitude and pressure altitude during the approach, followed by photographic determination of the position during the landing, can be used on multiple CAT instrument landings system equipped runways in up to CAT II weather conditions. For the en route flight path determination, a positioning system based on the sequential measurement of the distance of the aircraft to multiple distance measuring equipment (DME) and tactical air navigation system ground stations, combined with velocity information from an inertial sensor system and altitude information from an air data system, can be used (multi-DME/inertial position reference system). Author (ESA)

N83-13097# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
THE DIGITAL DATA ACQUISITION SYSTEM FOR THE FLIGHT TESTING OF THE FOKKER F29 AIRCRAFT
R. L. vanderVelde 24 Feb. 1981 30 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, May 1981
(NLR-MP-81019-U) Avail: NTIS HC A03/MF A01

An integrated measuring, recording and data processing system for the evaluation and certification tests of the Fokker F29 aircraft is described. The on board digital data acquisition system user requirements are discussed. The system can measure and record more than 1400 parameters over a wide range of sampling rates. Several data acquisition units are located remotely. The system handles ARINC-429 digital data buses. Dynamic measurement of aircraft performance and accurate trajectory determination are possible. User requirements include a mission success probability of 99%. Author (ESA)

N83-13098# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
INTRODUCTION TO FLIGHT TEST INSTRUMENTATION DESIGN
F. J. Abbink 27 Apr. 1981 43 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, Netherlands, May 1981
(NLR-MP-81021-U) Avail: NTIS HC A03/MF A01

Developments in flight test instrumentation are reviewed and instrumentation design aspects are considered in relation to the overall cost of flight testing. The instrumentation and data processing required for determination of available electric power during instrument landing approaches, determination of operational limits for helicopter use on ships, flight testing the gyro gunsight of a fighter aircraft, and flight testing a civil transport aircraft prototype are described. Author (ESA)

N83-13099# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
TRANSDUCER SELECTION
F. J. vanSchaik and S. Storm vanLeeuwen 28 Apr. 1981 52 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, Netherlands, May 1981
(NLR-MP-81028-U) Avail: NTIS HC A04/MF A01

The transducer selection process applied to the F29 digital data acquisition system is discussed. The procedure consists of interviews of system users, specification of the transducer part of the data acquisition system, transducer selection from manufacturer data, evaluation tests, integration into the data acquisition system and system tests. The interviews with the users lead to a parameter list for which parameter specification criteria are given. The selection of transducers that meet parameter list requirements is done by using transducer performance specification lists. Evaluation tests include acceptance tests, calibrations, environmental tests and preliminary flight tests. Transducer interaction with the total data acquisition system is tested during system integration in laboratory and flight conditions. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-13100*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

CF6 JET ENGINE DIAGNOSTICS PROGRAM. HIGH PRESSURE TURBINE ROUNDNESS/CLEARANCE INVESTIGATION

W. D. Howard and W. A. Fasching Jun. 1982 123 p refs

(Contract NAS3-20631)

(NASA-CR-165581; NAS 1.26:165581; R82AEB340) Avail: NTIS HC A06/MF A01 CSCL 21E

The effects of high pressure turbine clearance changes on engine and module performance was evaluated in addition to the measurement of CF6-50C high pressure turbine Stage 1 tip clearance and stator out-of-roundness during steady-state and transient operation. The results indicated a good correlation of the analytical model of round engine clearance response with measured data. The stator out-of-roundness measurements verified that the analytical technique for predicting the distortion effects of mechanical loads is accurate, whereas the technique for calculating the effects of certain circumferential thermal gradients requires some modifications. A potential for improvement in roundness was established in the order of 0.38 mm (0.015 in.), equivalent to 0.86 percent turbine efficiency which translates to a cruise SFC improvement of 0.36 percent. The HP turbine Stage 1 tip clearance performance derivative was established as 0.44 mm (17 mils) per percent of turbine efficiency at take-off power, somewhat smaller, therefore, more sensitive than predicted from previous investigations. M.G.

N83-13101*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF BROAD PROPERTIES FUEL ON INJECTOR PERFORMANCE IN A REVERSE FLOW COMBUSTOR

Stephen M. Raddlebaugh and Carl T. Norgren 1982 18 p refs Prepared for presentation at the 21st Aerospace Sci. Conf., Reno, Nev., 10-13 Jan. 1983; sponsored by AIAA

(NASA-TM-83013; E-1448; NAS 1.15:83013; AIAA-83-0154) Avail: NTIS HC A02/MF A01 CSCL 21E

The effect of fuel type on the performance of various fuel injectors was investigated in a reverse flow combustor. Combustor performance and emissions are documented for simplex pressure atomizing, spill flow, and airblast fuel injectors using a broad properties fuel and compared with performance using Jet A fuel. Test conditions simulated a range of flight conditions including sea level take off, low and high altitude cruise, as well as a parametric evaluation of the effect of increased combustor loading. The baseline simplex injector produced higher emission levels with corresponding lower combustion efficiency with the broad properties fuel. There was little or not less in performance by the two advanced concept injectors with the broad properties fuel. The airblast injector proved to be especially insensitive to fuel type. S.L.

N83-13102# National Aerospace Lab., Tokyo (Japan). Aeroengine Div.

AN EXPERIMENTAL AND ANALYTICAL STUDY OF BLADE TIP-CLEARANCE EFFECTS ON AN AXIAL-FLOW TURBINE PERFORMANCE

Atsumasa Yamamoto, Kitao Takahara, Hiroyuki Nouse, Fujio Mimura, Shigeo Inoue, and Hiroshi Usui Jan. 1982 37 p refs (NAL-TR-466T; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

In order to investigate the effects of rotor tip-clearance on a highly-loaded axial-flow turbine, for application to high-temperature engines, a cold-air test on a single-stage axial-flow turbine was conducted with three rotor tip-clearance to rotor blade height ratios in the range of 70% to approximately 110% turbine equivalent speeds and 1.4 to approximately 2.2 turbine equivalent total-to-total pressure ratios. The radial tip-clearance of the rotor was changed by increasing the diameter of the rotor shroud ring, while keeping the rotor blade tip diameter unchanged. Author

N83-13103*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

CONCEPTUAL DESIGN, EVALUATION AND RESEARCH IDENTIFICATION FOR REMOTE AUGMENTED PROPULSIVE LIFT SYSTEMS (RALS) WITH EJECTORS FOR VTOL AIRCRAFT Final Report

W. S. Willis, M. Konarski, and M. V. Sutherland May 1982 80 p refs

(Contract NAS3-22042)

(NASA-CR-167906; NAS 1.26:167906; R82AEB315) Avail: NTIS HC A05/MF A01 CSCL 21E

Ejector concepts for use with a remote augmented lift system (RALS) exhaust nozzle were studied. A number of concepts were considered and three were selected as having the greatest promise of providing the desired aircraft and exhaust gas cooling and lift enhancement. A scale model test program is recommended to explore the effects of the more important parameters on ejector performance. M.G.

N83-13104*# Solar Turbines International, San Diego, Calif.

INVESTIGATION OF A LOW NOx FULL-SCALE ANNULAR COMBUSTOR Final Report

Feb. 1982 79 p refs

(Contract NAS3-20616)

(NASA-CR-165518; NAS 1.26:165518; SR82-R-4621-36) Avail: NTIS HC A05/MF A01 CSCL 21E

An atmospheric test program was conducted to evaluate a low NOx annular combustor concept suitable for a supersonic, high-altitude aircraft application. The lean premixed combustor, known as the vortex air blast (VAB) concept, was tested as a 22.0-cm diameter model in the early development phases to arrive at basic design and performance criteria. Final demonstration testing was carried out on a full scale combustor of 0.66-m diameter. Variable geometry dilution ports were incorporated to allow operation of the combustor across the range of conditions between idle (T(in) = 422 K, T(out) = 917 K) and cruise (T(in) = 833 K, T(out) - 1778 K). Test results show that the design could meet the program NOx goal of 1.0 g NO2/kg fuel at a one-atmospheric simulated cruise condition. Author

N83-13105# Detroit Diesel Allison, Indianapolis, Ind.

TIME-VARIANT AERODYNAMICS FOR TRANSLATIONAL MOTION OF LARGE-TURNING AIRFOILS Final Report, Oct. 1980 - Feb. 1982

R. L. Jay, M. J. Gritton, and M. D. Rothrock Feb. 1982 144 p refs

(Contract N00019-80-C-0430)

(AD-A118884; DDA-EDR-10992) Avail: NTIS HC A07/MF A01 CSCL 21/5

A cascade of five airfoil sections modelling the hub section of an advanced design turbine featuring a high inlet Mach number

and 112 degrees of turning was evaluated at 4 steady-state conditions of varying exit Mach number and expansion ratio. The resulting steady-state airfoil surface pressures were compared to a state-of-the-art analytical prediction. A time-variant investigation was conducted at the 4 operating conditions of the steady-state experiment. Data from high response pressure transducers imbedded along the surfaces of the center airfoil was acquired by individually oscillating each airfoil of the cascade normal to its chord. From this data, the time-varying surface pressures as functions of interblade phase angle were quantified and compared with a current unsteady analysis. Author (GRA)

N83-13106# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
INSTRUMENTATION FOR GAS TURBINES
J. P. K. Vleghert 13 Apr. 1981 26 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, Netherlands, May 1981
(NLR-MP-81016-U) Avail: NTIS HC A03/MF A01

Instrumentation and test techniques for test bed and in flight trouble shooting of performance and handling aspects of gas turbine engines are discussed. Parameters essential for a performance check-up are listed, together with instrumentation systems. Problems such as the choice of sampling location, and the need for absolute integrity for probes in the gas upstream of rotating components are treated. Thrust calibration on a static test bed is considered, together with methods for obtaining in-flight thrust. High-response pressure instrumentation which can detect loss of compressor stall margin is described. Author (ESA)

N83-13107# Rolls-Royce Ltd., Derby (England).
RECENT ADVANCES IN THE PERFORMANCE OF HIGH BYPASS RATIO FANS
D. J. Nicholas and C. Freeman 1982 14 p refs Sponsored by UK Ministry of Defence Procurement Executive
(PNR-90120) Avail: NTIS HC A02/MF A01

The special aerodynamic features of high bypass ratio transonic fans are described and progress in fan performance since the original RB 211-22B design is summarized. Aerodynamic performance data from model and engine size fans are compared, to show the standard of test and analysis techniques required to ensure that improvements in fan technology are realised in production engines. Theoretical and experimental techniques employed to study loss mechanisms within high Mach number blading are outlined. Linking the classical axisymmetric design approach with the quasi-3D flow observations results in more realistic theoretical modeling ot the 3D flow field. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-13108 California Univ., Los Angeles.
SUBOPTIMAL CONTROLLER DESIGN USING FREQUENCY DOMAIN CONSTRAINTS Ph.D. Thesis
Rick Dale Hefner 1982 186 p
Avail: Univ. Microfilms Order No. DA8219691

The application of modern control theory to physical problems relies on the absolute fidelity of the mathematical model used to describe the physical system. For large, flexible space structures, one of the most prominent sources of modeling error is the deletion of modes in the formation of the design model. This truncation arises from limitations of modeling accuracy and computational considerations in the control system synthesis process. To address these problems, a method for designing a controller which is robust with respect to truncated flexible modes is described. The approach involves minimization of a performance index that combines standard linear regulator penalties with robustness measures in the frequency domain. The frequency domain criteria are chosen so as to sufficiently attenuate the high frequency response of the full dynamic system while maintaining the overall performance of the closed loop system. Dissert. Abstr.

N83-13109 Georgia State Univ., Atlanta.
HELICOPTER VIBRATION SUPPRESSION USING SIMPLE PENDULUM ABSORBERS ON THE ROTOR BLADE Ph.D. Thesis
Mohamed-Nabil Hamouda 1982 186 p
Avail: Univ. Microfilms Order No. DA8221808

A comprehensive analytical design procedure for the installation of simple pendulums on the blades of a helicopter rotor to suppress the root reactions is presented. A frequency response analysis is conducted of typical rotor blades excited by a harmonic variation of spanwise airload distributions as well as a concentrated load at the tip. The structural modeling of the blade includes elastic degrees of freedom in flap and lead lag bending plus torsion with a hingeless hub constraint. Simple flap and lead lag pendulums are individually considered. On the basis of a rational ordering scheme the general nonlinear equations of motion for the rotor pendulum system are linearized in the perturbation elastic displacements and pendulum angle. A quasi-steady aerodynamic representation is utilized in the formation of these air loads. The solution of the system equations is based on their representation as a transfer matrix. Dissert. Abstr.

N83-13110*# Calspan Corp., Buffalo, N. Y.
AN IN-FLIGHT INVESTIGATION OF PILOT-INDUCED OSCILLATION SUPPRESSION FILTERS DURING THE FIGHTER APPROACH AND LANDING TASK
R. E. Bailey and R. E. Smith Mar. 1982 147 p refs Sponsored in part by NASA
(Contract F33615-79-C-3618)
(NASA-CR-163116; NAS 1.26:163116; Rept-6645-F-9) Avail: NTIS HC A07/MF A01 CSCL 01C

An investigation of pilot-induced oscillation suppression (PIOS) filters was performed using the USAF/Flight Dynamics Laboratory variable stability NT-33 aircraft, modified and operated by Calspan. This program examined the effects of PIOS filtering on the longitudinal flying qualities of fighter aircraft during the visual approach and landing task. Forty evaluations were flown to test the effects of different PIOS filters. Although detailed analyses were not undertaken, the results indicate that PIOS filtering can improve the flying qualities of an otherwise unacceptable aircraft configuration (Level 3 flying qualities). However, the ability of the filters to suppress pilot-induced oscillations appears to be dependent upon the aircraft configuration characteristics. Further, the data show that the filters can adversely affect landing flying qualities if improperly designed. The data provide an excellent foundation from which detail analyses can be performed. Author

N83-13111# Toronto Univ. (Ontario). Inst. of Aerospace Studies.
CONTROL LOGIC FOR LANDING-ABORT AUTOPILOT MODE
Bernard Etkin and Shangxiang Zhu Feb. 1982 93 p refs Sponsored by the Natl. Sci. and Eng. Res. Council of Canada
(UTIAS-258; ISSN-0082-5255) Avail: NTIS HC A05/MF A01

An automatic control for an aborted landing is discussed with emphasis on the use of a body-mounted accelerometer, which is assumed to be both available and reliable, to provide a surrogate for an angle-of-attack signal. The control logic was developed for a typical large commercial jet transport and tested by simulation on a digital computer. The system developed met the objective: achieve a safe aborted landing and climb-out, such as might be required as a result of missing the landing window at Cat. II decision height, in the presence of severe wind shear. The performance demonstrated shows the logic to be effective and safe for initiating a go-around maneuver. Author

N83-13112*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HELICOPTER SIMULATION VALIDATION USING FLIGHT DATA

David L. Key, Raymond S. Hansen, William B. Cleveland, and William Y. Abbott (Army Aviation Engineering Flight Activity) Nov. 1982 16 p refs Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-84291; A-9063; NAS 1.15:84291; AVRADCOM-TR-82-A-14) Avail: NTIS HC A02/MF A01 CSCL 01C

A joint NASA/Army effort to perform a systematic ground-based piloted simulation validation assessment is described. The best available mathematical model for the subject helicopter (UH-60A Black Hawk) was programmed for real-time operation. Flight data were obtained to validate the math model, and to develop models for the pilot control strategy while performing mission-type tasks. The validated math model is to be combined with motion and visual systems to perform ground based simulation. Comparisons of the control strategy obtained in flight with that obtained on the simulator are to be used as the basis for assessing the fidelity of the results obtained in the simulator. Author

N83-13113*# Honeywell Systems and Research Center, Minneapolis, Minn.
ADVANCED FLIGHT CONTROL SYSTEM STUDY Final Report
G. L. Hartmann, J. E. Wall, Jr., E. R. Rang, H. P. Lee, R. W. Schulte, and W. K. Ng Nov. 1982 171 p refs Prepared in cooperation with Lockheed-California Co., Burbank
(Contract NAS4-2876)
(NASA-CR-163117; NAS 1.26:163117; HONEYWELL-82SRC5) Avail: NTIS HC A08/MF A01 CSCL 01C

A fly by wire flight control system architecture designed for high reliability includes spare sensor and computer elements to permit safe dispatch with failed elements, thereby reducing unscheduled maintenance. A methodology capable of demonstrating that the architecture does achieve the predicted performance characteristics consists of a hierarchy of activities ranging from analytical calculations of system reliability and formal methods of software verification to iron bird testing followed by flight evaluation. Interfacing this architecture to the Lockheed S-3A aircraft for flight test is discussed. This testbed vehicle can be expanded to support flight experiments in advanced aerodynamics, electromechanical actuators, secondary power systems, flight management, new displays, and air traffic control concepts. A.R.H.

N83-13114*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECTS OF PILOT STRESS FACTORS ON HANDLING QUALITY ASSESSMENTS DURING US/GERMAN HELICOPTER AGILITY FLIGHT TESTS
H.-J. Pausder (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.v., Braunschweig, West Germany) and R. M. Gerdes Oct. 1982 20 p refs
(NASA-TM-84194; A-9084; NAS 1.15:84194) Avail: NTIS HC A02/MF A01 CSCL 01C

Flight tests were conducted with two helicopters to study and evaluate the effects of helicopter characteristics and pilot and task demands on performance in nap-of-the-Earth flight. Different, low-level slalom courses were set up and were flown by three pilots with different levels of flight experience. A pilot rating questionnaire was used to obtain redundant information and to gain more insight into factors that influence pilot ratings. The flight test setups and procedures are described, and the pilot ratings are summarized and interpreted in close connection with the analyzed test data. Pilot stress is discussed. The influence of demands on the pilot, of the helicopter characteristics, and of other stress factors are outlined with particular emphasis on how these factors affect handling-qualities assessment. Author

N83-13115*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
A FLIGHT TEST MANEUVER AUTOPILOT FOR A HIGHLY MANUEVERABLE AIRCRAFT
Ralph B. Roncoli Nov. 1982 27 p refs Presented at the AIAA region 6 32nd Ann. Student Conf., Irvine, Calif., 28 Apr. - 1 May 1982
(NASA-TM-81372; H-1176; NAS 1.15:81372) Avail: NTIS HC A03/MF A01 CSCL 01C

A flight test maneuver autopilot (FTMAP) is currently being flown to increase the quality and quantity of the data obtained in the flight testing of the highly maneuverable aircraft technology (HiMAT) remotely piloted research vehicle (RPRV). The FTMAP resides in a ground-based digital computer and was designed to perform certain prescribed maneuvers precisely, while maintaining critical flight parameters within close tolerances. The FTMAP operates as a non-flight-critical outer loop controller and augments the vehicle primary flight control system. The inputs to the FTMAP consist of telemetry-downlinked aircraft sensor data. During FTMAP operation, the FTMAP computer replaces normal pilot inputs to the aircraft stick and throttle positions. The FTMAP maneuvers include straight-and-level flight, level accelerations and decelerations, pushover pullups, and windup turns. The pushover pullups can be executed holding throttle or Mach number fixed. The windup turns can be commanded by either normal acceleration or angle of attack. The operational procedures, control mode configuration, and initial simulation results are discussed. R.J.F.

N83-13116# Perceptronics, Inc., Woodland Hills, Calif.
ANALYSIS AND MODELING OF INFORMATION HANDLING TASKS IN SUPERVISORY CONTROL OF ADVANCED AIRCRAFT Final Technical Report
Yee-Yeen Chu, Ken Chen, Cynthia Clark, and Amos Freedy May 1982 123 p refs
(Contract F49620-79-C-0130; AF Proj. 2313)
(AD-A119067; PFTR-1080-82-5) Avail: NTIS HC A06/MF A01 CSCL 01/3

The problems addressed in this study stem from the increasing supervisory loads imposed on the operator in airborne system operations. Future aircraft will be characterized by high information loads, several time constraints, and complex decisions regarding allocation of operator's attention, as well as display resources. The information costs and the limited processing capabilities of the human operator makes it necessary to optimize the information selected, processed, and displayed. Techniques for information selection were developed based on multi-attribute utility models and queueing formulations. These techniques take into account both subjective, individual preference factors and needs of the operator. An experiment was conducted based on a computer-aided, multi-task airborne information-handling situation with different aiding and demand levels. Model-based recommendations led toward superior performance, both in low and high stress situations. The techniques provided an analytic framework that was helpful in identifying the individual operator's information handling strategies. These techniques are expected to be useful in specifying needs and for training operators or systems to efficiently perform information handling tasks. Author (GRA)

N83-13117# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
THE INFLUENCE OF THE RATIO OF CONTROL FORCE TO CONTROL PATH IN A MINIATURE CONTROL ELEMENT [EINFLUSS DES VERHAELTNISSES STEUERKRAFT ZU STEURWEG BEI EINEM MINIATURISIERTEN BEDIENELEMENT]
Wolf Roeger and Manfred Rohlfs 29 Jan. 1980 46 p refs In GERMAN
(TUBS/FB-80-01-02) Avail: NTIS HC A03/MF A01

For a manual compensation control with two degrees of freedom, the effect of the ratio of control force to the deviation and of the different grip forms was investigated in a miniaturized aircraft control element. Effective values of the control deviation and of the output signal of the control element were measured. As regards force domain, the deviation determined the output signal, while the related control force was changed. For the adjustment domain tests, the output signal resulted from the control force and the related deviation was changed. The force domain shows no effect on the control accuracy. Improvements of the control accuracy show up with larger adjustment domains. The grip form also influences the control accuracy. Author (ESA)

N83-13118# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
A CONTRIBUTION TO THE INVESTIGATION OF THE DYNAMIC BEHAVIOR OF A CONTROLLED AIRCRAFT UNDER WIND SHEAR CONDITIONS [EIN BEITRAG ZUR UNTERSUCHUNG DES DYNAMISCHEN VERHALTENS EINES GEREGELTEN FLUGZEUGS UNTER SCHERWINDEINFLUSS]
Wolfgang Alles Jul. 1980 97 p refs In GERMAN
(TUBS/FB-80-07-01) Avail: NTIS HC A05/MF A01

The efficacy of aircraft controllers under wind shear conditions was investigated. Wind shear effects, investigated controller concepts and shear wind types are described. The results of simulation calculations and Boeing 707 flight simulations show that approach endangering by vertical wind shears can be avoided by a forward thrust controller. Flying and flight path errors can be limited by increasing the adjustment and measurement effort, respectively. Also for automatic flight control, a wind shear indication would be desirable for the pilot. Author (ESA)

N83-13119# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
PROGRAMMING OF A TRAJECTORY CONTROL CALCULATOR FOR CALCULATION, MANIPULATION AND DESCRIPTION OF 4D FLIGHT TRAJECTORIES [PROGRAMMIERUNG EINES BAHNFUEHRUNGSRECHNERS ZUR BERECHNUNG, MANIPULATION UND DARSTELLUNG VON 4-D-FLUGBAAHNEN]
Peter Sundermeyer 1981 213 p refs In GERMAN
(TUBS/FB-81-08-01) Avail: NTIS HC A10/MF A01

Programs developed for a trajectory control calculator are described. The transformations and treatment of the analytical relations required for the preparation of the programs are documented. The run of the program is illustrated by means of signal flow pictures. The digital calculation program controls, in the form of a continuous process calculation, the data acquisition from external devices and additional calculators, respectively, as well as the data transfer to external devices and calculators, respectively. Data processing and transfer between the real trajectory control calculator and the additional devices and calculators are explained by means of tables. Author (ESA)

N83-13120# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
NONLINEAR OBSERVERS FOR ESTIMATION OF THE STATE VARIABLES OF AN AIRCRAFT LATERAL MOTION [NICHTLINEARE BEOBACHTER ZUR SCHAETZUNG VON ZUSTANDSGROESSEN DER LAENGSBEWEGUNG EINES FLUGZEUGES]
Harald Siedel 1981 198 p refs In GERMAN
(TUBS/FB-81-11-01) Avail: NTIS HC A09/MF A01

The estimation of the state variables of an aircraft using a nonlinear observer was investigated. The theory of linear and nonlinear observers is presented. The practical development of a nonlinear observer is explained by means of the linearized estimation error equations. The estimation of the state variables of an aircraft lateral motion is treated. The behavior in case of perturbations and the relation between observer construction and measuring goodness of the input variables are discussed. Results show that a nonlinear observer allows the estimation of elevation angle, angle of attack and trajectory angle under certain assumptions. Simulations show that nonlinear observers can be applied in a large flight domain. Author (ESA)

N83-13121# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
AIRBORNE FLIGHT TRAJECTORY PLANNING AS A NEW PILOT TASK Thesis [BORDSEITIGE FLUGBAHNPLANUNG ALS NEUE PILOTENAUFGABE]
Lore Haack-Voersmann 3 Mar. 1982 173 p refs In GERMAN
(TUBS/FB-82-04-01) Avail: NTIS HC A08/MF A01

The changes in the pilot tasks required by increasing flight control automation are discussed. Reasons for, and examples of, automation as well as resulting problems are presented. The concept of task sharing between pilot and flight system in determining the flight trajectory was proposed. The system allows the pilot to plan the trajectory in the neighborhood of an airport, using a flight trajectory calculator. A questionnaire including, besides biographical data, mainly the cognitive elements of the pilot function subject to special changes in the framework of automation, was developed and statistically evaluated. Results show that the questionned pilots developed a knowledge of the problems resulting from automation. The realizability of the system is determined. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-13122*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
DEVELOPMENT OF CLOSED LOOP ROLL CONTROL FOR MAGNETIC BALANCE SYSTEMS Final Report, Feb. 1978 - Feb. 1982
Eugene E. Covert, Charles W. Haldeman, Gautham Ramohalli, and Peter Way Hampton, Va. NASA. Langley Research Center Oct. 1982 86 p refs
(Grant NsG-1502)
(NASA-CR-166017; NAS 1.26:166017) Avail: NTIS HC A05/MF A01 CSCL 14B

This research was undertaken with the goal of demonstrating closed loop control of the roll degree of freedom on the NASA prototype magnetic suspension and balance system at the MIT Aerophysics Laboratory, thus, showing feasibility for a roll control system for any large magnetic balance system which might be built in the future. During the research under this grant, study was directed toward the several areas of torque generation, position sensing, model construction and control system design. These effects were then integrated to produce successful closed loop operation of the analogue roll control system. This experience indicated the desirability of microprocessor control for the angular degrees of freedom. Author

N83-13123# National Aerospace Lab., Tokyo (Japan). Second Aerodynamics Div.
CONSTRUCTION AND PERFORMANCE OF NAL TWO-DIMENSIONAL TRANSONIC WIND TUNNEL
Feb. 1982 52 p refs
(NAL-TR-647T; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

The construction and the results of initial calibration are described for a tunnel built to meet the requirements of high Reynolds number testing of wing sections at transonic regime. This blowndown tunnel has a test section of 0.3m x 1.0m. The required capability of the tunnel is for Mach numbers ranging from 0.2 to 1.2 and for a Reynolds number up to 40 x 100 to the 6th power at Mach number 0,8 with sufficient running time. The design objectives are outlined and the completed facilities, i.e., the wind tunnel, the instrumentation and operation system, the silencer and auxiliary equipment of the air compressor and the air reservoir, are described. The performance of the tunnel is discussed based on experimental results. High Reynolds number effects on the airfoil characteristics are clarified experimentally. Author

N83-13124*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
A UNIQUE FLIGHT TEST FACILITY: DESCRIPTION AND RESULTS
Robert R. Meyer, Jr. Nov. 1982 19 p refs Presented at 13th Congr. of the Intern. Council of the Aeron. Sci. (ICAS)/AIAA Aircraft Systems and Technol. Conf., Seattle, 22-27 Aug. 1982
(NASA-TM-84900; NAS 1.15:84900; ICAS-Paper-82-5.3.3) Avail: NTIS HC A02/MF A01 CSCL 14B

The Dryden Flight Research Facility has developed a unique research facility for conducting aerodynamic and fluid mechanics experiments in flight. A low aspect ratio fin, referred to as the flight test fixture (FTF), is mounted on the underside of the fuselage of an F-104G aircraft. The F-104G/FTF facility is described, and the capabilities are discussed. The capabilities include (1) a large Mach number envelope (0.4 to 2.0), including the region through Mach 1.0; (2) the potential ability to test articles larger than those that can be tested in wind tunnels; (3) the large chord Reynolds number envelope (greater than 40 million); and (4) the ability to define small increments in friction drag between two test surfaces. Data are presented from experiments that demonstrate some of the capabilities of the FTF, including the shuttle thermal protection system airload tests, instrument development, and base drag studies. Proposed skin friction experiments and instrument evaluation studies are also discussed. Author

N83-13125# Aeronautical Research Labs., Melbourne (Australia).
A PROJECTED LARGE LOW-SPEED WIND TUNNEL TO MEET AUSTRALIAN REQUIREMENTS. AERODYNAMICS NOTE
D. A. Lemaire, N. Matheson, and D. H. Thompson Mar. 1982 24 p refs
(AD-A118913; ARL/AERO NOTE-410) Avail: NTIS HC A02/MF A01 CSCL 20/4

The requirement for a major new Australian low speed wind tunnel is examined in this report and the form such a facility should take is proposed. The existing low speed wind tunnel has been in service for 40 years during which time it has made many valuable contributions to the needs of the military services and the Australian aircraft industry, as well as to many diverse civil needs. All of the locally developed aircraft, targets and drones, guided missiles and free-fall weapons have been extensively tested in this tunnel and numerous investigation have been carried out on non-aeronautical subjects including funnel plumes, flow separations on ships' hulls, flows over airstrips and around buildings, road vehicles and wind generators. During the early sixties the tunnel performance was increased when a new power plant and fan of twice the original capacity were provided. In the seventies a digital data acquisition, recording and control system was installed to increase tunnel productivity and efficiency. However, despite these improvements, the continuing demand for tests of expanding range and diversity has produced a growing need for a larger wind tunnel with improved flow quality. A salient factor has been the increased emphasis in recent years on support for Australian military air operations. GRA

N83-13126# Maritiem Research Inst. Nederland, Wageningen.
DESCRIPTION OF THE PLANAR MOTION MECHANISM (PMM) [PLANAR MOTION MECHANICSM (PMM): BESCHRIJVING]
C. N. J. Gommers and P. vanOossanen Oct. 1981 16 p In DUTCH Original contains color illustrations
(Contract A78/KM/137)
(Rept-42685-6-IS) Avail: NTIS HC A02/MF A01

An oscillating device for submarine models was built in order to test hydrodynamical model characteristics. The device is equipped with an hydraulic driving system in order to allow oscillations with different time dependent functions (sinusoidal, triangular and block form). The oscillator consists of two hydraulic cylinders. One cylinder mantle is fixed to the towing carriage via a frame. The cylinder rod provides oscillating, towing and transverse forces. The other cylinder can rotate around an axis perpendicular to the motion plane of both cylinders and thus allows rotation of the submarine. Oscillations are possible in a vertical as well as in a horizontal plane. Struts mounted on the piston rods are connected to the model via dynamometers and hinges, allowing measurment of all the forces on the model. The data can be used in mathematical models. Author (ESA)

N83-13127# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Haupabteilung Raumfahrt.
STUDY OF A LARGE SOLAR SIMULATOR AT ESTEC Final Report
Frey Paris ESA 11 Feb. 1982 60 p
(Contract ESTEC-4782/81/NL-PP(SC))
(B-TR-128/21; ESA-CR(P)-1626) Avail: NTIS HC A04/MF A01

Three 6m off-axis solar simulator configurations are presented: direct incidence from above; one deflection mirror, with beam deflected from a separate building through the girders of the existing building; and one deflection mirror, with the lamp house located as near the solar simulator vessel as possible. Four options are possible: 5m diameter test plane with 33kW irradiance power; 5m plane, filtering, with 50kW power (unfiltered); 6m plane, with 50kW power; and square beam (6.3 X 4.5 sq m) with 50kW power. Design parameters and performance data are presented for all configurations. Author (ESA)

N83-13128# British Aerospace Aircraft Group, Preston (England). Research Test Facility.
MULTI POINT EXCITATION GROUND RESONANCE TEST FACILITY AT BRITISH AEROSPACE WARTON
A. Croft and T. E. Simmons Mar. 1982 16 p
(BAe-TN-5411) Avail: Issuing Activity

A mobile facility used for fighter aircraft ground tests is described. It has two 1500N maximum excitation channels, and eight 200N maximum channels, manually or semiautomatically controlled. Data logging is controlled by a PDP 8e minicomputer. Resonant frequency, mode phase shape distribution, structural damping, mode linearity, and generalized mass can be measured. A fast Fourier transformation program is also available. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-13129*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
MANUFACTURING IN SPACE: FLUID DYNAMICS NUMERICAL ANALYSIS Annual Report
S. J. Robertson, L. A. Nicholson, and L. W. Spradley Sep. 1982 84 p
(Contract NASw-3281)
(NASA-CR-169536; NAS 1.26:169536; LMSC-HREC-TR-D867640) Avail: NTIS HC A05/MF A01 CSCL 22A

Numerical computations were performed for natural convection in circular enclosures under various conditions of acceleration. It was found that subcritical acceleration vectors applied in the direction of the temperature gradient will lead to an eventual state of rest regardless of the initial state of motion. Supercritical acceleration vectors will lead to the same steady state condition of motion regardless of the initial state of motion. Convection velocities were computed for acceleration vectors at various angles of the initial temperature gradient. The results for Rayleigh numbers of 1000 or less were found to closely follow Weinbaum's first order theory. Higher Rayleigh number results were shown to depart significantly from the first order theory. Supercritical behavior was confirmed for Rayleigh numbers greater than the known supercritical value of 9216. Response times were determined to provide an indication of the time required to change states of motion for the various cases considered. Author

N83-13130*# National Aeronautics and Space Administration, Washington, D. C.
SPACE RESEARCH AND TECHNOLOGY PROGRAM: PROGRAM AND SPECIFIC OBJECTIVES, DOCUMENT APPROVAL
13 Jun. 1982 177 p
(NASA-TM-85162; NAS 1.15:85162) Avail: NTIS HC A09/MF A01 CSCL 22A

A detailed view of the Space Research and Technology program work breakdown structure is provided down to the specific objective level. Goals or objectivs at each of these levels are set forth. The specific objective narratives are structured into several parts. First, a short paragraph statement of the specific objective

is given. This is followed by a list of subobjectives. A list of targets is then provided for those areas of the specific objective that are amenable to a quantitative description of technical accomplishment and schedule. Fluid and thermal physics, materials and structures, computer science and electronics, space energy conversion, multidisciplinary research, controls and human factors, chemical propulsion, spacecraft systems, transportation systems, platform systems, and spaceraft systems technology comprise the principal research programs. N.W.

N83-13131# Office of Technology Assessment, Washington, D.C.
CIVILIAN SPACE POLICY AND APPLICATIONS: SUMMARY
Jun. 1982 24 p refs
(OTA-STI-178) Avail: NTIS HC A02/MF A01 CSCL 22A

The question of Federal involvement in space research and development; the issues that arise in the transition from R&D to full fledged operational status; when and under what circumstances commercial involvement is appropriate; and how to respond to commercial competition from overseas are addressed. Options available for the future deployment of U.S. land remote-sensing systems are investigated and the status of advanced satellite communications research within the National Aeronautics and Space Administration is explored. The potential for manufacturing useful products in space and for commercializing space transportation systems is assessed. A.R.H.

N83-13132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NSSDC DATA LISTING
Sep. 1982 68 p
(NASA-TM-85156; NAS 1.15:85156; NSSDC/WDC-A-R/S-82-23) Avail: NTIS HC A04/MF A01

The launch date and ID are printed for each spacecraft. The experiments are listed alphabetically by the principal investigator's or team leader's last name following the spacecraft name. The experiment name and ID are printed for each experiment. The data sets are listed by ID following the experiment name. The data set name, data form code, quantity of data, and the time span of the data as verified are printed for each data set. Supplementary data contains a listing of ground-based data, models, computer routines, and composite spacecraft data that are available. This list is arranged alphabetically by discipline, source, data type, data content, and then data set. It gives the data set name, data form code, quantity of data, and the time span covered where appropriate. S.L.

N83-13133*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT. PIONEER VENUS MISSION SUCCESS ASSESSMENT
8 Dec. 1982 16 p
(NASA-TM-85142; S-825-78-01/02; NAS 1.15:85142) Avail: NTIS HC A02/MF A01 CSCL 22A

The results of the Pioneer Venus Mission are summarized and the successes of the operations are assessed. Included are the scientific objectives and the results of the multiprobe Mission, Orbiter Primary Mission, and Phase 1 of the Orbiter's Extended Mission. Plans for Phase 3 of the Orbiter's Extended Mission are included. R.J.F.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N83-13134*# National Aeronautics and Space Administration, Washington, D. C.
NASA EDUCATIONAL BRIEFS FOR THE CLASSROOM. ORBITS OF BODIES IN SPACE
1982 3 p
(NASA-EB-82-3) Avail: NTIS HC A02/MF A01 CSCL 22A

The difference between an orbit and a revolution is explained and it is shown why space shuttle Columbia's period of revolution was longer than its orbital period. Parameters of orbits examined include apoapsis, periapsis, apogee, perigee, aphelion, perihelion, orbital plane, and inclination. Orbit velocity and duration, Newton's law of gravitation, and Kepler's three laws of motion are considered. The principles involved in geostationary satellites are also explored. A.R.H.

N83-13135# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ADAPTIVE TECHNIQUES AND THE KALMAN FILTER APPLIED TO THE DETERMINATION OF THE ORBITS OF LOW ALTITUDE SATELLITES [TECNICAS ADAPTATIVAS E FILTRO DE KALMAN APLICADOS A DETERMINACAO DE ORBITA DE SATELITES A BAIXA ALTITUDE]
Ricardo Negreiros dePaiva Apr. 1982 5 p refs In PORTUGUESE Presented at the INPE-LCC Seminar, Rio de Janeiro, 25-27 Nov. 1981
(INPE-2379-PRE/104) Avail: NTIS HC A02/MF A01

A procedure for estimation in parametric space for the determination of the orbits of artificial satellites in the presence of unmodeled acceleration is presented. An expanded Kalman filter is used with a dynamic filter given for two body motion, which is treated in a parametric space using the Kustaanheimo-Stiefel transformation. An explicit analytic solution in parametric time is obtained. Unmodeled effects are approximated by a first order Gauss-Markov process in the transformed space, and included in the estimation procedure by the definition of an extended state. The results obtained using this estimation method are compared with a digital simulation of actual satellite orbits and with observations made by topocentric tracking stations. Transl. by J. D.

N83-13136# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON THE OBSERVATIONS AND COMPUTATIONS CARRIED OUT IN THE SECOND EUROPEAN DOPPLER OBSERVATION CAMPAIGN (EDOC-2) FOR POSITION DETERMINATIONS AT 37 SATELLITE TRACKING STATIONS Final Report
C. Boucher (Institut Geographique National, St. Mande, France), P. Paquet (Observatoire Royal de Belgique, Brussels), and P. Wilson 1981 113 p refs Sponsored by Council of Europe and ESA
(Ser-B-255-Mitt-261; ISSN-0071-9196) Avail: NTIS HC A06/MF A01

The motivation for EDOC-2, field operations, data preprocessing and computational methods are described. All solutions computed by the different computing centers are analyzed and presented as differences with respect to the finally adopted solution. The results include computations, using both broadcast and precise ephemerides. The comparison with European Date 1950 shows up obvious regional deficiencies in the terrestrial network. Geodetic coordinate sheets of the different stations are presented.
Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-13137*# Lockheed Missiles and Space Co., Palo Alto, Calif.
COMPARATIVE FEASIBILITY STUDY OF TWO CONCEPTS FOR A SPACE-BASED ASTROMETRIC SATELLITE
L. Bamdermann, N. Bareket, and W. Metheny Nov. 1982 221 p refs
(Contract NAS2-11040)
(NASA-CR-166403; NAS 1.26:166403; LMSC-D870885) Avail: NTIS HC A10/MF A01 CSCL 22B

A comparative feasibility study of two concepts for an astrometric satellite: a visual imaging telescope with a 16.5 meter focal length and a white light interferometer with a 15 meter baseline separation was conducted. Author

N83-13138# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentatin.
MILLIMETER WAVE LINK FOR ANTITANK GUIDED MISSILES
Wolf-D. Schuck 1982 15 p refs Presented at IDEE Conf., Hanover, 18-20 May 1982
(MBB-UA-608/81) Avail: Issuing Activity

Design and performance aspects of a millimeter wave link for antitank guided missiles are treated. Link parameters, antennas, and line of sight propagation are discussed. Multipath fading, electronic countermeasure resistance and detectability are covered. A complex analysis of technical and tactical problems is inevitable in order to define a radiating command link which has an overall performance of the whole weapon system. Multipath effects must be particularly considered. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N83-13139*# Rockwell International Corp., Pittsburgh, Pa. Space Operations and Satellite Systems Div.
SPACE OPERATIONS CENTER, SHUTTLE INTERACTION STUDY, VOLUME 1 Final Report
17 Apr. 1981 326 p 2 Vol.
(Contract NAS9-16153)
(NASA-CR-167763; NAS 1.26:166763; SSD-81-0076-Vol-1; DRL-T-1626-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 22A

The feasibility of the shuttle remote manipulator system (SRMS)-aided space operations center (SOC)/orbiter berthing was evaluated to determine: (1) whether the initial rates between the SOC and the orbiter can be removed by the arm; (2) what is the best strategy to be used; (3) whether the post-capture and maneuvering loads are within the capability of the SRMS; (4) can the SOC berthing port be brought in the immediate proximity of the orbiter berthing port; and (5) what is the best way to remove the residual relative motions. Various notational conventions are established and various important locations on the orbiter and SOC structures are defined. Reference frames are defined together with the mass properties of both the SOC and the orbiter. A.R.H.

N83-13140*# Rockwell International Corp., Pittsburgh, Pa. Space Operations and Satellite Systems Div.
SPACE OPERATIONS CENTER, SHUTTLE INTERACTION STUDY. VOLUME 2, APPENDICES, BOOK 1 OF 2 Final Report
17 Apr. 1981 293 p 2 Vol.
(Contract NAS9-16153)
(NASA-CR-167764; NAS 1.26:167764; SSD-81-0076-Vol-2; DRL-T-1626-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 22A

The feasibility of shuttle orbiter docking to the Space Operations Center (SOC) is studied. The in-orbit relative motion of the free flying orbiter and SOC was simulated, accounting for the Orbiter RCS and digital autopilot (DAP) systems, orbital mechanics, center of gravity offset of the orbiter docking port, aero and gravity gradient effects, and other pertinent natural and man-made phenomena. Since there is no specified flight path and procedure for docking, terminal closure sensitivities were investigated. Orbiter approach direction, Orbiter approach attitude out of plane, DAP thruster compensation mode, final ballistic docking distance and time to dock, rate and excursion attitude deadbands, and selection of various thruster combinations (differing from nominal) for translational pulses are considered. S.L.

N83-13141*# Rockwell International Corp., Pittsburgh, Pa. Space Operations and Satellite Systems Div.
SPACE OPERATIONS CENTER, SHUTTLE INTERACTION STUDY. VOLUME 2, APPENDICES, BOOK 2 OF 2 Final Report
17 Mar. 1981 190 p 2 Vol.
(Contract NAS9-16153)
(NASA-CR-167765; NAS 1.26:167765; SSD-81-0076-Vol-2; DRL-T-1626-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22A

The implication of using the Shuttle with the SOC, including constraints that the Shuttle places upon the SOC design is studied. The considerations involved in the use of the Shuttle as a part of the SOC concept, and the constraints to the SOC imposed by the Shuttle in its interactions with the SOC, and on the design or technical solutions which allow satisfactory accomplishment of the interactions are identified. S.L.

N83-13142*# Rockwell International Corp., Downey, Calif.
SPACE OPERATIONS CENTER: SHUTTLE INTERACTION STUDY EXTENSION, EXECUTIVE SUMMARY Final Report
Feb. 1982 121 p refs
(Contract NAS9-16153)
(NASA-CR-167766; NAS 1.26:167766; SSD-81-0194) Avail: NTIS HC A06/MF A01 CSCL 22A

The Space Operations Center (SOC) is conceived as a permanent facility in low Earth orbit incorporating capabilities for space systems construction; space vehicle assembly, launching, recovery and servicing; and the servicing of co-orbiting satellites. The Shuttle Transportation System is an integral element of the SOC concept. It will transport the various elements of the SOC into space and support the assembly operation. Subsequently, it will regularly service the SOC with crew rotations, crew supplies, construction materials, construction equipment and components, space vehicle elements, and propellants and spare parts. The implications to the SOC as a consequence of the Shuttle supporting operations are analyzed. Programmatic influences associated with propellant deliveries, spacecraft servicing, and total shuttle flight operations are addressed. S.L.

N83-13143*# Rockwell International Corp., Downey, Calif. Satellite Systems Div.
SPACE OPERATIONS CENTER: SHUTTLE INTERACTION STUDY EXTENSION, VOLUME 1 Final Report
Feb. 1982 269 p refs
(Contract NAS9-16153)
(NASA-CR-167767; NAS 1.26:167767; SSD-81-0194-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 22A

The programmatic issues identified are the SOC operational altitude, the SOC assembly, propellant delivery, spacecraft servicing, and a mission traffic model. Implications for the SOC operations, OTV, and Shuttle operations are addressed. S.L.

N83-13144*# Rockwell International Corp., Downey, Calif. Satellite Systems Div.
SPACE OPERATIONS CENTER: SHUTTLE INTERACTION STUDY EXTENSION. VOLUME 2: APPENDIXES Final Report
Feb. 1982 164 p refs
(Contract NAS9-16153)

(NASA-CR-167768; NAS 1.26:167768; SSD-81-0194-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 22A

The servicing functions definitions and activity data sheets are included. Detailed time and manpower estimates, and cost analysis sheets are presented. S.L.

N83-13145*# National Aeronautics and Space Administration, Washington, D. C.

NASA EDUCATIONAL BRIEFS FOR THE CLASSROOM. SHUTTLE'S FOURTH TEST FLIGHT

1982 4 p

(NASA-EB-82-5) Avail: NTIS HC A02/MF A01 CSCL 22A

The STS-4 is described. The environmental characteristics of the Shuttle cargo bay and near space were measured. Experiments performed during the flight are briefly summarized. S.L.

N83-13146*# Martin Marietta Aerospace, Denver, Colo. Space and Electronics Systems.

FEASIBILITY STUDY OF THE SOLAR SCIENTIFIC INSTRUMENTS FOR SPACELAB/ORBITER Final Report

J. Leritz, T. Rasser, E. Stone, B. Lockhart, W. Nobles, J. Parham, D. Eimers, D. Peterson, W. Barnhart, and S. Schrock Mar. 1981 205 p refs

(Contract NAS5-26362)

(NASA-CR-169610; NAS 1.26:169610) Avail: NTIS HC A10/MF A01 CSCL 22B

The feasibility and economics of mounting and operating a set of solar scientific instruments in the backup Skylab Apollo Telescope Mount (ATM) hardware was evaluated. The instruments used as the study test payload and integrated into the ATM were: the Solar EUV Telescope/Spectrometer; the Solar Active Region Observing Telescope; and the Lyman Alpha White Light Coronagraph. The backup ATM hardware consists of a central cruciform structure, called the 'SPAR', a 'Sun End Canister' and a 'Multiple Docking Adapter End Canister'. Basically, the ATM hardware and software provides a structural interface for the instruments; a closely controlled thermal environment; and a very accurate attitude and pointing control capability. The hardware is an identical set to the hardware that flow on Skylab. S.L.

N83-13147*# National Aeronautics and Space Administration, Washington, D. C.

MISSION OPERATION REPORT. STS-5 MISSION ASSESSMENT

7 Dec. 1982 12 p

(NASA-TM-85141; M-989-82-05; NAS 1.15:85141) Avail: NTIS HC A02/MF A01

The fifth flight of the Space Shuttle Columbia, designated STS-5, (the first operational flight of the Space Transportation System) is assessed. Mission accomplishments are reviewed against the objectives and a description of the flight is provided. R.J.F.

N83-13148*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.

AN EVALUATION OF SPACE SHUTTLE STS-2 PAYLOAD BAY ACOUSTIC DATA AND COMPARISON WITH PREDICTIONS

John F. Wilby, Allan G. Piersol, and Emma G. Wilby Jul. 1982 70 p refs

(Contract NAS5-26570)

(NASA-CR-170451; NAS 1.26:170451; BBN-4748) Avail: NTIS HC A04/MF A01 CSCL 22B

Space average sound pressure levels computed from measurements at 18 locations in the payload bay of the Space Shuttle orbiter vehicle during the STS-2 launch were compared with predicted levels obtained using the PACES computer program. The comparisons were performed over the frequency range 12.5 Hz to 1000 Hz, since the test data at higher frequencies are contaminated by instrumentation background noise. In general the PACES computer program tends to overpredict the space average sound levels in the payload bay, although the magnitude of the discrepancy is usually small. Furthermore the discrepancy depends to some extent on the manner in which the payload is modeled analytically, and the method used to determine the 'measured' space average sound pressure levels. Thus the difference between predicted and measured sound levels, averaged over the 20 one third octave bands from 12.5 Hz to 1000 Hz, varies from 1 dB to 3.5 dB. S.L.

N83-13149*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE SHUTTLE WITH IMPROVED EXTERNAL PROPELLANT TANK Patent Application

George L. vonPragenau, inventor (to NASA) Filed 15 Sep. 1982 17 p

(NASA-Case-MFS-25853; US-Patent-Appl-SN-418138) Avail: NTIS HC A02/MF A01 CSCL 22B

The configuration and relationship of the external propellant tank and solid rocket boosters of space transportation systems such as the space shuttle are described. The space shuttle system with the improved propellant tank is shown. The external tank has a forward pressure vessel for liquid hydrogen and an aft pressure vessel for liquid oxygen. The solid rocket boosters are joined together by a thrust frame which extends across and behind the external tank. The thrust of the orbiter's main rocket engines are transmitted to the aft portion of the external tank and the thrust of the solid rocket boosters are transmitted to the aft end of the external tank. A modification of the external tank is shown. NASA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-13150 Columbia Univ., New York.

ASPECTS OF THE DYNAMICS AND CONTROLLABILITY OF LARGE FLEXIBLE STRUCTURES Ph.D. Thesis

1982 263 p

Avail: Univ. Microfilms Order No. DA8222423

The generation of equations of motion of a free-free beam whose overall motion is completely unrestricted is discussed. It is seen that the classical theory is inadequate for the case of large rotational rates where certain nonlinear elastic assumptions come into play. The beam is considered an elementary example of a "pervasively" flexible satellite in an investigation of various nominal motions of interest in spacecraft dynamics. A controllability index whose overriding concern is with the fuel expended in accomplishing system regulation is defined as well as a scalar measure (the degree of controllability) whose primary importance obtains from its usefulness as a criterion for control actuator placement on large multi-dimensional systems. A numerical study delineating the actuator placement problem is presented with the simply supported beam serving as the primary example. Disturbance rejection is discussed and proposed as a scalar measure. Dissert. Abstr.

N83-13151*# Vought Corp., Dallas, Tex.
SYSTEMS EVALUATION OF THERMAL BUS CONCEPTS Final Report
D. D. Stalmach 9 Feb. 1982 123 p refs
(Contract NAS9-16321)
(NASA-CR-167774; NAS 1.26:167774; Rept-2-53200/2R-53050) Avail: NTIS HC A06/MF A01 CSCL 22B

Thermal bus concepts, to provide a centralized thermal utility for large, multihundred kilowatt space platforms, were studied and the results are summarized. Concepts were generated, defined, and screened for inclusion in system level thermal bus trades. Parametric trade studies were conducted in order to define the operational envelope, performance, and physical characteristics of each. Two concepts were selected as offering the most promise for thermal bus development. All of four concepts involved two phase flow in order to meet the required isothermal nature of the thermal bus. Two of the concepts employ a mechanical means to circulate the working fluid, a liquid pump in one case and a vapor compressor in another. Another concept utilizes direct osmosis as the driving force of the thermal bus. The fourth concept was a high capacity monogroove heat pipe. After preliminary sizing and screening, three of these concepts were selected to carry into the trade studies. The monogroove heat pipe concept was deemed unsuitable for further consideration because of its heat transport limitations. One additional concept utilizing capillary forces to drive the working fluid was added. Parametric system level trade studies were performed. Sizing and weight calculations were performed for thermal bus sizes ranging from 5 to 350 kW and operating temperatures in the range of 4 to 120 C. System level considerations such as heat rejection and electrical power penalties and interface temperature losses were included in the weight calculations. Author

N83-13152*# Boeing Co., Seattle, Wash.
DEVELOPMENT OF PRELIMINARY DESIGN CONCEPT FOR A MULTIFUNCTION DISPLAY AND CONTROL SYSTEM FOR THE ORBITER CREW STATION. TASK 4: DESIGN CONCEPT RECOMMENDATION Progress Report
R. J. Spiger, R. J. Farrell, and G. A. Holcomb 1982 116 p refs (Contract NAS9-16445)
(NASA-CR-167769; NAS 1.26:167769; D180-27215-1) Avail: NTIS HC A06/MF A01 CSCL 22B

Application of multifunction display and control systems to the NASA Orbiter spacecraft offers the potential for reducing crew workload and improving the presentation of system status and operational data to the crew. A design concept is presented for the application of a multifunction display and control system (MFDCS) to the Orbital Maneuvering System and Electrical Power Distribution and Control System on the Orbiter spacecraft. The MFDCS would provide the capability for automation of procedures, fault prioritization and software reconfiguration of the MFDCS data base. The MFDCS would operate as a stand-alone processor to minimize the impact on the current Orbiter software. Supervisory crew command of all current functions would be retained through the use of several operating modes in the system. Both the design concept and the processes followed in defining the concept are described. Author

N83-13153*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
IMPACT IONIZATION STUDY Final Report
Elden C. Whipple, Jr. Nov. 1982 28 p refs
(Grant NAGw-225)
(NASA-CR-169545; NAS 1.26:169545) Avail: NTIS HC A03/MF A01 CSCL 22B

The impact ionization phenomenon which was observed on certain spacecraft was studied. The phenomenon occurs when a neutral atom, molecule, or ion strikes a surface with sufficient kinetic energy that either the incident neutral or atoms on the surface are ionized, with subsequent escape of ions and/or electrons. The released ions and electrons can interfere with measurements on the spacecraft by confusing interpretation of the data. On the other hand, there is the possibility that the effect could be developed into a diagnostic tool for investigating neutral atmospheric species or for studying physical processes on spacecraft surfaces. S.L.

N83-13154*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED 30/20 GHz MULTIPLE-BEAM ANTENNAS FOR COMMUNICATIONS SATELLITES
Royce W. Myhre 1982 21 p refs Presented at the Symp. on Antenna Applications, Monticello, Ill., 22-24 Sep. 1982; sponsored by AFSC and Illinois Univ.
(NASA-TM-82952; E-1365; NAS 1.15:82952) Avail: NTIS HC A02/MF A01 CSCL 22B

Design concepts under development utilize two separate spacecraft antenna systems, one uplink at 30 GHz and the other a downlink at 20 GHz, where each antenna provides multiple fixed and scanning beams. Two contractors completed configuration trade-off studies and breadboarding of critical technology components, and are fabricating and testing proof-of-concept (POC) models to demonstrate the technology feasibility. Technology developments required for the proposed systems are presented, along with each contractor's progress to date. The technology development areas discussed include: (1) offset Cassegrain and shaped reflector systems for narrow beams with low sidelobes and wideangle off-axis scan; (2) diplexed beam-forming networks for dual polarization, low sidelobes, and fixed and scan-beam operation; (3) fast switching networks for scanning beams; and (4) fabrication of precision feed components and large offset reflectors. A.R.H.

N83-13155# Aerospace Corp., El Segundo, Calif. Vehicle Engineering Div.
DEVELOPMENT OF AN ANALYTICAL MODEL FOR LARGE SPACE STRUCTURES Final Report, Oct. 1980 - Sep. 1981
Mohan Aswani 15 Mar. 1982 99 p refs
(Contract F04701-81-C-0082)
(AD-A119349; TR-0082(9975)-1; SD-TR-82-59) Avail: NTIS HC A05/MF A01 CSCL 12/1

A methodology is presented for modeling large truss-type structures based on the concept of equivalent continuum. The equivalent effective elastic and dynamic properties of the continuum model in terms of the material and geometric properties of the truss are derived in a simple and straightforward manner. The accuracy of the model is demonstrated in a free vibration problem, when the results are compared to those obtained from the conventional finite element method. Both simply supported and free-free boundary conditions are considered. In addition, the assumptions made in obtaining the continuum solution are discussed. Numerical results clearly indicate the potential of this approach for modeling large repetitive truss-type structures.
Author (GRA)

N83-13156# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
THE ASTROPLATFORM: A DEDICATED REUSUABLE SHUTTLE PLATFORM
Dieter E. Koelle 1981 18 p Presented at 20th Goddard Memorial Symp. and 4th Joint AAS/DLGR Symp., Greenbelt, Md., Mar. 1982
(MBB-UR-550/82) Avail: Issuing Activity

The implementation of a spacecraft concept, the reusable platform, for the space shuttle is discussed. The feasibility and economy of this approach are stressed. As an example, the Astroplatform is described. It is a small platform with high pointing accuracy which can be equipped with different telescopes in sequence. This makes it possible to plan for a series of missions with the same basic spacecraft which is refurbished after each flight and re-equipped with another instrument. The economic advantages of this approach are considerable. Comparison with expendable spacecraft and STS sortie missions, using the IPS, shows a reduction of the program cost of about 50%.
Author (ESA)

N83-13157# IFM Akustibyran A.B., Stockholm (Sweden). Structural Dynamics Dept.
STUDY IN COMPARING THE SEVERITY OF DESIGN AND TEST LOAD SPECTRA. WORK PACKAGE 1: SURVEY OF COMPARISON METHODS Final Report
Odd Sylwan Paris ESA Nov. 1981 87 p refs
(Contract ESTEC-4627/81/NL-AK(SC))
(ESA-CR(P)-1618) Avail: NTIS HC A05/MF A01

The state of the art of sinusoid, random, and acoustic vibration spectra comparison methods, and design load calculation methods were surveyed. A set of fatigue and magnitude based design load and equivalence equations was developed. Equivalence values were calculated and a sensitivity analysis of the equations of random-sinusoidal dwell equivalence, slow sinusoidal sweep - sinusoidal dwell equivalence, and random - slow sinusoidal sweep was performed. Author (ESA)

N83-13158# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
STUDY OF DESIGN METHODOLOGIES FOR DIGITAL ATTITUDE CONTROL SYSTEM ALGORITHMS. VOLUME 1: ONBOARD COMPUTING FOR ATTITUDE CONTROL SUBSYSTEMS (AOCS) Final Report
F. Teule, T. Zwartbol (NLR), C. Slippens (NLR), W. vanderVoortMaarschalk (Signaal), and H. Lamberts (Signaal) Paris ESA Apr. 1982 166 p refs 4 Vol.
(Contract ESA-4346/80/NL-AK(SC))
(RV-R-82-007-Vol-1; ESA-CR(P)-1630-Vol-1) Avail: NTIS HC A08/MF A01

The state of the art in onboard computing for digital attitude control subsystems (AOCS) is illustrated by the infrared astronomical satellite and Voyager systems. Functional, software and hardware aspects of general importance for AOCS are discussed. Fault tolerance in hardware and software as a fundamental approach towards reliable AOCS design is treated. The characteristics of the microprocessors used are summarized. Author (ESA)

N83-13159# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
STUDY OF DESIGN METHODOLOGIES FOR DIGITAL ATTITUDE CONTROL SYSTEM ALGORITHMS. VOLUME 2: ATTITUDE CONTROL SUBSYSTEMS (AOCS) SOFTWARE PROCUREMENT Final Report
F. Teule, T. Zwartbol (NLR), C. Slippens (NLR), W. vanderVoortMaarschalk(Signaal), and H. Lamberts (Signaal) Paris ESA Apr. 1982 242 p refs 4 Vol.
(Contract ESA-4346/80/NL-AK(SC))
(RV-R-82-007-Vol-2; ESA-CR(P)-1630-Vol-2) Avail: NTIS HC A11/MF A01

A managerial framework for AOCS onboard software production is defined. Design methods, and development and test programs are evaluated. Software life cycle phases, documentation, programming languages, and quality assurance are covered. A glossary of software terminology (100 terms) is provided. Author (ESA)

N83-13160# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
STUDY OF DESIGN METHODOLOGIES FOR DIGITAL ATTITUDE CONTROL SYSTEM ALGORITHMS. VOLUME 3: NEW ILLUSTRATIVE CONCEPT SATELLITE (NICS), A CASE STUDY IN ATTITUDE CONTROL SUBSYSTEMS (ADCS) SOFTWARE PROCUREMENT Final Report
F. Teule, T. Zwartbol (NLR), C. Slippens (NLR), W. vanderVoortMaarschalk (Signaal), and H. Lamberts (Signaal) Paris ESA Apr. 1982 183 p 4 Vol.
(Contract ESA-4346/80/NL-AK(SC))
(RV-R-82-007-Vol-3; ESA-CR(P)-1630-Vol-3) Avail: NTIS HC A09/MF A01

The mission and AOCS of NICS are outlined, and the phase B and phase C/D documentation are presented. Phase B documents include the preliminary software requirements specification, giving the AOCS functional requirements for implementation as AOCS computer program, the software architectural design, which comprises operating system, AOCS application software and timing aspects, and interface control documents. Phase C/D documents include a specification change from four gyros to six, the software requirements specification in which AOCS functions and algorithms are defined, unit specifications, the computer program component specifications, and a listing. Author (ESA)

N83-13161# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
STUDY OF DESIGN METHODOLOGIES FOR DIGITAL ATTITUDE CONTROL SYSTEM ALGORITHMS. VOLUME 4: EXECUTIVE SUMMARY
F. Teule, T. Zwartbol (NLR), C. Slippens (NLR), W. vanderVort-Maarschalk (Signaal), and H. Lamberts (Signall) Paris ESA Apr. 1982 31 p 4 Vol.
(Contract ESA-4346/80/NL-AK(SC))
(RV-R-82-030-Vol-4; ESA-CR(P)-1630-Vol-4) Avail: NTIS HC A03/MF A01

The state of the art in onboard AOCS data processing is illustrated by infrared astronomical satellite and Voyager systems. A managerial framework for AOCS onboard-software production is defined. Documentation examples generated during phase B and phase C/D of an AOCS software procurement program are presented. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N83-13162# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
DEFINITION STUDY FOR THE ON BOARD DATA MANAGEMENT FOR SPACEBORNE RADAR ALTIMETER. VOLUME 1: EXECUTIVE SUMMARY
N. J. J. Bunnik, G. Th. Hermans (Signaal), R. C. vanHoltz, W. C. Huisman, J. vanKasteel, J. C. A. vanderLubbe, G. J. L. Nooren, J. J. Renes, and B. vanWeel (Signaal) Paris ESA 17 Dec. 1981 35 p ref 2 Vol.
(Contract ESA-4653/81/NL-PP(SC))
(NLR-TR-81149-I-Vol-1; ESA-CR(P)-1635-Vol-1) Avail: NTIS HC A03/MF A01

A qualitative tradeoff of implementing ERS-1 radar altimeter algorithms on board versus on the ground, both for a centralized system and one which is augmented with low-cost ground stations was used to define a processing system. Specifications for the on board processing segment are given, based on the functions to be implemented, established system interfaces, and operational constraints. The impact of the chosen implementation on the ground processing segment is discussed insofar as it differs from the traditional (SEASAT-like) implementation. The use of the maximum likelihood estimate (MLE) concept for science parameter extraction is evaluated. Only the instrument control function is maintained on board. An MLE is proposed for onground data extraction, but would be unsuitable on board. Author (ESA)

N83-13163# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
DEFINITION STUDY FOR THE ON BOARD DATA MANAGEMENT FOR SPACEBORNE RADAR ALTIMETER. VOLUME 2: STUDY RESULTS
N. J. J. Bunnik, G. Th. Hermans, R. C. vanHoltz, W. C. Huisman, J. vanKasteel, J. C. A. vanderLubbe, G. J. L. Nooren, J. J. Renes, and B. vanWeel Paris ESA 17 Dec. 1981 193 p refs 2 Vol.
(Contract ESA-4653/81/NL-PP(SC))
(NLR-TR-81149-I-Vol-2; ESA-CR(P)-1635-Vol-2) Avail: NTIS HC A09/MF A01

A qualitative tradeoff of implementing ERS-1 radar altimeter algorithms on board versus on the ground, both for a centralized system and one which is augmented with low-cost ground stations was used to define a processing system. Specifications for the on

board processing segment are given, based on the functions to be implemented, established system interfaces, and operational constraints. The impact of the chosen implementation on the ground processing segment is discussed insofar as it differs from the traditional (SEASAT-like) implementation. The use of the maximum likelihood estimate (MLE) concept for science parameter extraction is evaluated. Only the instrument control function is maintained on board. An MLE is proposed for onground data extraction, but would be unsuitable on board. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-13164*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED ION CONTAINMENT USING A RING-CUSP ION THRUSTER
J. S. Sovey 1982 25 p refs Presented at the 16th intern. Elec. Propulsion Conf., New Orleans, 17-19 Nov. 1982; sponsored by the AIAA, Japan Society for Aeronautical and Space Sciences and Deutsche Gesselschaft fuer Luftund Raumfahrt
(NASA-TM-82990; E-1422; NAS 1.15:82990) Avail: NTIS HC A02/MF A01 CSCL 21C

A 30-centimeter diameter ring-cusp ion thruster is described which operates at inert gas ion beam currents up to about 7 ampere, with significant improvements in discharge chamber performance over conventional divergent-field thrusters. The thruster has strong boundary ring-cusp magnetic fields, a diverging field on the cathode region, and a nearly field-free volume upstream of the ion extraction system. Minimum ion beam production costs of 90 to 100 watts per beam ampere (W/A) were obtained for argon, krypton and xenon. Propellant efficiencies in excess of 0.90 were achieved at 100 to 120 W/A for the three inert gases. The ion beam charge-state was documented with a collimating mass spectrometer probe to allow evaluation of overall thruster efficiencies. Author

N83-13165# National Aerospace Lab., Tokyo (Japan).
A STUDY ON HEAT TRANSFER CHARACTERISTICS OF WATER COOLED LO2/LH2 ROCKET COMBUSTOR
Masayuki Niino, Akinaga Kumakawa, Nobuyuki Yatuyanagi, Hiromi Gomi, Akio Suzuki, Hiroshi Sakamoto, Masaki Sasaki, and Koji Yanagawa 1982 40 p refs In JAPANESE; ENGLISH summary (NAL-TR-708) Avail: NTIS HC A03/MF A01

The amount of enthalpy increase of coolant in regeneratively cooled engines was investigated. A water cooled calorimetric combustor was used to determine the local heat flux distribution along the axis and the boiling characteristics of cooling water under various combustion conditions was studied. The variation of burning parameters, such as pressure, mixture ratio and hydrogen injection temperature, significantly influenced the distribution of wall heat flux rate along the axis and the total heat input to the wall. The local value of heat transfer coefficient in the thrust chamber was roughly correlated by the hydrogen-oxygen injection velocity ratio. In the coolant side, the surface with fine triangular fins had excellent heat transfer characteristics. Three kinds of empirical formulas for the boiling characteristics on that surface, namely, the incipience of fully developed nucleate boiling, heat transfer in nucleate boiling region and critical heat flux rate, were derived. S.L.

N83-13166# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
VERIFICATION OF SUITABILITY OF MERCURY AS A POSSIBLE PROPELLANT FOR A FIELD EMISSION THRUSTER Final Report
Paris ESA Oct. 1981 27 p refs
(Contract ESA-4053/79/NL-AK(SC))
(ESA-CR(P)-1615) Avail: NTIS HC A03/MF A01

A medical syringe, containing nickel wire wetted by mercury, was used to study the efficiency of an electric thruster with mercury instead of cesium. Results confirm, low efficiency (23%), attributed mainly to the neutral flow rate. High neutral flow rate, or charged droplet emission, are required. Emission from an extremely sharp slit edge or capillary (dense plasma emission) is recommended, rather than emission from a surface via Taylor cone. Author (ESA)

N83-13167# United Kingdom Atomic Energy Authority, Abingdon (England).
FIELD EMISSION ELECTRIC PROPULSION ION OPTICS OF SLIT EMITTERS AND BEAM FOCUSSING Final Report
I. L. Robertson and P. F. Little Paris ESA Jan. 1982 36 p ref (Contract ESTEC-4460/80/NL-AK(SC))
(CLM/RR/E1/29; ESA-CR(P)-1639) Avail: NTIS HC A03/MF A01

The trajectories of ions in a field emission thruster were simulated in order to investigate the effect of varying the electrode geometry, incorporating both a rear focusing electrode and a decelerating, neutralizing electrode. The rear electrode efficiently decreases the angular spread of the beam. A configuration including the neutralizing electrode was found, for which the beam divergence is < 20 deg (half angle) while the average E-field in the gap is kept below 10kV/mm, minimizing the likelihood of breakdown between the thruster electrodes. A high current density does not increase the divergence but it may be impossible to achieve the necessary electrostatic fields without breakdown. If the requirement for a focussed beam is relaxed, electrode configurations and potential distributions which permit emission without violating the breakdown criteria can be realized. The resulting divergent beams carry up to 70% to 80% of the axial momentum carried by a beam parallel to the axis. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-13168*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HEATS OF FORMATION AND THERMODYNAMIC FUNCTIONS FOR C2H, C3H, AND C4H FROM 300 K TO 6000 K
Anthony F. Saturno Nov. 1982 25 p refs
(NASA-TM-84537; L-15500; NAS 1.15:84537) Avail: NTIS HC A02/MF A01 CSCL 20M

A review of the energy level and heat of formation data for the species C2H, C3H, and C4H is given. The procedure for computing thermochemical data from partition function is also reviewed. Working expressions for approximate partition functions, free-energy function, enthalpy function, and heat capacity for a linear polyatomic species are presented. Author

N83-13169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MICROHARDNESS STUDIES ON THIN CARBON FILMS GROWN ON P-TYPE, (100) SILICON
Joseph C. Kolecki Nov. 1982 11 p refs
(NASA-TM-82980; E-1410; NAS 1.15:82980) Avail: NTIS HC A02/MF A01 CSCL 20L

A program to grow thin carbon films and investigate their physical and electrical properties is described. Characteristics of films grown by rf sputtering and vacuum arc deposition on p type, (100) silicon wafers are presented. Microhardness data were obtained from both the films and the silicon via the Vickers diamond indentation technique. These data show that the films are always harder than the silicon, even when the films are thin (of the order of 1000 A). Vacuum arc films were found to contain black carbon

inclusions of the order of a few microns in size, and clusters of inclusions of the order of tens of microns. Transmission electron diffraction showed that the films being studied were amorphous in structure. Author

N83-13170# Amherst Coll., Mass.
ISOTOPE EFFECTS IN THE SOLUTION OF GASES IN LIQUIDS Progress Report, 1 Jul. 1981 - 30 Jul. 1982
B. B. Benson and D. Krause, Jr. 30 Jul. 1982 12 p refs
(Contract DE-AC02-78ER-05031)
(DE82-019919; DOE/ER/05031/4; COO-5031-4) Avail: NTIS HC A02/MF A01

For pure aqueous solutions of simple gases, interpretation of isotopic fractionation data in terms of an harmonic potential model indicated a possible relationship between solute cavities in water and cages in Structure I clathrate hydrates. This suggested that experiments be carried out to see if isotopic fractionation of guest molecules occurs during the formation of clathrates. Preliminary work shows that for argon 36/40 enclathrated at 770K a fractionation of 12.6 per mil occurs between the enclathrated gas and that in the vapor phase. Because the structure of clathrates is well known, isotopic measurements of this kind may be useful not only with respect to clathrates but also for a better understanding of liquid water. Manometric methods are being used for very accurate determinations of changes in the thermodynamic properties of gaseous solutions when deuterium is substituted for hydrogen in water. For example, at 50C neon is 14.7% more soluble in D20 than it is in H2O. Work is continuing on the clathrates, on solubilities in D2O, and on isotopic fractionation of gases dissolved in nonaqueous solutions. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N83-13171* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DENSIFICATION OF POROUS REFRACTORY SUBSTRATES Patent
Glenn M. Ecord and Calvin Schomburg, inventors (to NASA) Issued 9 Nov. 1982 5 p Filed 22 May 1981 Supersedes N81-29180 (19 - 20, p 0868)
(NASA-Case-MSC-18737-1; US-Patent-4,358,486;
US-Patent-Appl-SN-266256; US-Patent-Class-427-379;
US-Patent-Class-427-384; US-Patent-Class-427-387;
US-Patent-Class-428-218) Avail: US Patent and Trademark Office CSCL 11D

A hydrolyzed tetraethyl orthosilicate is applied to the surface of a porous refractory substrate following which the substrate is heated to a temperature and for a period of time sufficient to bond the silica released from the tetraethyl orthosilicate to the substrate. The surface is thus densified and strengthened.
Official Gazette of the U.S. Patent and Trademark Office

N83-13172* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD OF REPAIRING SURFACE DAMAGE TO POROUS REFRACTORY SUBSTRATES Patent
Glenn M. Ecord, inventor (to NASA) Issued 9 Nov. 1982 7 p Filed 22 May 1981 Supersedes N81-29231 (19 - 20, p 2743)
(NASA-Case-MSC-18736-1; US-Patent-4,358,480;
US-Patent-Appl-SN-266254; US-Patent-Class-427-140;
US-Patent-Class-244-158A; US-Patent-Class-427-292;
US-Patent-Class-427-379; US-Patent-Class-427-384;
US-Patent-Class-427-387; US-Patent-Class-427-302;
US-Patent-Class-428-63) Avail: US Patent and Trademark Office CSCL 11D

A damaged porous refractory material coated with a glass coating is repaired by applying hydrolyzed tetraethyl orthosilicate to the damaged area and curing it. A pliable filler comprised of hydrolyzed tetraethyl orthosilicate and powdered refractory substrate is then applied to the area which is then heated.
Official Gazette of the U.S. Patent and Trademark Office

N83-13173*# Purdue Univ., Lafayette, Ind. Composite Materials Lab.
DYNAMIC RESPONSES OF GRAPHITE/EPOXY LAMINATED BEAM TO IMPACT OF ELASTIC SPHERES
C. T. Sun and T. Wang Sep. 1982 59 p refs
(Grant NsG-3185)
(NASA-CR-165461; NAS 1.26:165461; CML-82-4) Avail: NTIS HC A04/MF A01 CSCL 11D

Wave propagation in [90/45/90/-45/90]2s and [0/45/0/-45/0]2s laminates of a graphite/epoxy composite due to impact of a steel ball was investigated experimentally and also by using a high order beam finite element. Dynamic strain responses at several locations were obtained using strain gages. The finite element program which incorporated statically determined contact laws was employed to calculate the contact force history as well as the target beam dynamic deformation. The comparison of the finite element solutions with the experimental data indicated that the static contact laws for loading and unloading (developed under this grant) are adequate for the dynamic impact analysis. It was found that for the [0/45/0/-45/0]2s laminate which has a much larger longitudinal bending rigidity, the use of beam finite elements is not suitable and plate finite element should be used instead.
Author

N83-13174*# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT OF LIGHTWEIGHT, FIRE RETARDANT, LOW SMOKE, THERMALLY STABLE, HIGH STRENGTH FLOOR PANELING: PASSENGER FLOOR PANELS Final Report
F. J. Gorges 1982 46 p refs
(Contract NAS9-16400)
(NASA-CR-167770; NAS 1.26:167770; D6-51689) Avail: NTIS HC A03/MF A01 CSCL 11D

A fire retardant, low smoke-emitting, thermally stable, light weight sandwich paneling, suitable for high traffic flooring on a passenger aircraft, was evaluated. The material is of sandwich panel construction, with graphite face sheets (a phenolic-vinyl resin) and honeycomb core. The lower side of the paneling is coated with a Fluorel elastomer L-4805, which provides an additional fire barrier, as well as reduced noise transmission. S.L.

N83-13175*# Rockwell International Corp., Downey, Calif. Space Systems Group.
DEVELOPMENT AND DEMONSTRATION OF MANUFACTURING PROCESSES FOR FABRICATING GRAPHITE/LARC-160 POLYIMIDE STRUCTURAL ELEMENTS, PART 4, PARAGRAPH C Quarterly Progress Report, 16 Mar. - 15 Jun. 1980
[1981] 78 p
(Contract NAS1-15371)
(NASA-CR-159303-Pt-4; NAS 1.26:159303-Pt-4; SOD79-0128-6; QPR-8) Avail: NTIS HC A05/MF A01 CSCL 11D

Progress in the development of processes for production of Celion/LARC-160 graphite-polyimide materials, quality control methods, and the fabrication of Space Shuttle composite structure components is reported. The formulation and processing limits for three batches of resin are presented. Process improvements for simplification of the imidizing and autoclave cure cycles are described. Imidized and autoclave cured test panels were prepared. Celion/LARC-160 cure process verification and the fabrication of honeycomb sandwich panel elements and skin/stringer panels are described. C-scans of laminates imidized at 163 C to 218 C for periods from 30 to 180 minutes, and of process verification laminates made from different batches of prepreg are presented. Failure modes and load/strain characteristics of sandwich elements and C-scans of stringer to skin bond joints are also given. J.D.

N83-13176*# Rockwell International Corp., Downey, Calif. Space Systems Group.
DEVELOPMENT AND DEMONSTRATION OF MANUFACTURING PROCESSES FOR FABRICATING GRAPHITE/LARC-160 POLYIMIDE STRUCTURAL ELEMENTS, PART 4, PARAGRAPH B

Quarterly Progress Report, 16 Jun. - 15 Sep. 1980
[1981] 37 p
(Contract NAS1-15371)
(NASA-CR-159303-Pt-4B; NAS 1.26:159303-Pt-4B; SOD79-0128-7; QPR-9) Avail: NTIS HC A03/MF A01 CSCL 11D

Progress in the development of processes for production of Celion/LARC-160 graphite-polyimide materials, quality control, and the fabrication of Space Shuttle composite structure components is reported. Liquid chromatographic analyses of three repeatability batches were performed and are compared to previous Hexcel standard production and to variables study LARC-160 intermediate resins. Development of processes for chopped fiber molding are described and flexural strength, elastic modulus, and other physical and mechanical properties of the molding are presented. J.D.

N83-13177*# Boeing Commercial Airplane Co., Seattle, Wash.
EFFECT OF MATRIX RESIN ON THE IMPACT FRACTURE CHARACTERISTICS OF GRAPHITE-EPOXY LAMINATES Final Report
P. E. Hertzberg, B. W. Smith, and A. G. Miller Jan. 1982 131 p refs
(Contract NAS1-15107)
(NASA-CR-165784; NAS 1.26:165784; D6-51677) Avail: NTIS HC A07/MF A01 CSCL 11D

The effect of resin chemistry on basic impact energy absorbent mechanisms exibited by graphite-epoxy composites was investigated. Impact fracture modes and microscopic resin deformation characteristics were examined for 26 NASA-impacted graphite epoxy laminates with different resin chemistries. Discrete specimen fracture modes were identified through cross sectional examination after impact, and subsequently compared with measured glass transition temperatures, cure cycles, and residual impact capabilities. Microscopic resin deformation mechanisms and their overall relationship to impact loading conditions, voids, and resin content were also characterized through scanning electron microscopic examination of separated fracture surfaces. Author

N83-13178*# IIT Research Inst., Chicago, Ill.
HIGH STRAIN RATE PROPERTIES OF UNDIRECTIONAL COMPOSITES, PART 1 Final Report, 11 Jul. 1977 - 11 Apr. 1981
I. M. Daniel Nov. 1981 460 p refs
(Contract NAS3-21016)
(NASA-CR-167969; NAS 1.26:167969) Avail: NTIS HC A20/MF A01 CSCL 11D

Experimental methods were developed for testing and characterization of composite materials at strain rates ranging from quasi-static to over 500s-1. Three materials were characterized, two graphite/epoxies and a graphite/S-glass/epoxy. Properties were obtained by testing thin rings 10.16 cm (4 in.) in diameter, 2.54 cm (1 in.) wide, and 6 to 8 plies thick under internal pressure. Unidirectional 0-deg, 90-deg, and 10-deg off-axis rings were tested to obtain longitudinal, transverse, and in-plane shear properties. In the dynamic tests internal pressure was applied explosively through a liquid and the pressure was measured with a calibrated steel ring. Strains in the calibration and specimen rings were recorded with a digital processing oscilloscope. The data were processed and the equation of motion solved numerically by the mini-computer attached to the oscilloscope. Results were obtained and plotted in the form of dynamic stress-strain curves. Longitudinal properties which are governed by the fibers do not vary much with strain rate with only a moderate (up to 20 percent) increase in modulus. Author

N83-13179*# IIT Research Inst., Chicago, Ill.
HIGH STRAIN RATE PROPERTIES OF OFF-AXIS COMPOSITE LAMINATES, PART 2 Final Report, 11 Jul. 1977 - 11 Apr. 1981
I. M. Daniel Nov. 1981 172 p refs
(Contract NAS3-21016)
(NASA-CR-167970; NAS 1.26:167970) Avail: NTIS HC A08/MF A01 CSCL 11D

Unidirectional off-axis graphite/epoxy and graphite/S-glass/epoxy laminates were characterized in uniaxial tension at strain rates ranging from quasi-static to over 500s-1. Laminate ring specimens were loaded by internal pressure with the tensile stress at 22.5, 30, and 45 deg with the fiber direction. Results were presented in the form of stress-strain curves to failure. Properties determined included moduli, Poisson's ratios, strength, and ultimate strain. In all three laminates of both materials the modulus and strength increase sharply with strain rate, reaching values roughly 100%, 150%, and 200% higher than corresponding static values for the (22.5 sub 8, (30 sub 8), and 45 sub 8) laminates, respectively. In the case of ultimate strain no definite trends could be established, but the maximum deviation from the average of any value for any strain rate was less than 18%. Author

N83-13180*# IIT Research Inst., Chicago, Ill.
HIGH STRAIN PROPERTIES OF ANGLE-PLY COMPOSITE LAMINATE, PART 3 Final Report, 11 Jul. 1977 - 11 Apr. 1981
I. M. Daniel Nov. 1982 383 p refs
(Contract NAS3-21016)
(NASA-CR-167971; NAS 1.26:167971) Avail: NTIS HC A17/MF A01 CSCL 11D

Angle-ply graphite/epoxy and graphite/S-glass/epoxy laminates were characterized in uniaxial tension at strain rates ranging from quasi-static to over 500s-1. Laminate ring specimens and layups were loaded under internal pressure. Results were presented in the form of stress-strain curves to failure. Properties determined included moduli, Poisson's ratios, strength, and ultimate strain. In all seven laminates for the two materials tested the modulus and strength increase with strain rate. The effect of strain rate varies with layup, being lowest for the fiber dominated laminates and highest for the matrix dominated laminates. Ultimate strains do not show any significant trends with strain rate. In almost all cases the ultimate strain values are within plus or minus 20 percent of the mean value and in half of the cases the deviations from the mean are less than 10 percent. R.J.F.

N83-13181*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STUDY OF FIBER MATERIALS FOR USE IN TEMPERATURE RESISTANT FIBER REINFORCED COMPOSITES Annual Status Report, 1 Jul. 1981 - 30 Jun. 1982
Michael J. Bachowsky and Robert N. Anderson 12 Oct. 1982 19 p Prepared in cooperation with San Jose State Univ.
(Contract NCC2-3)
(NASA-TM-85164; NAS 1.15:85164) Avail: NTIS HC A02/MF A01 CSCL 11D

This study has been directed at characterizing the microproperties of candidate ceramics and glasses for use in making fibers used in fiber reinforced material composites. Particular emphasis has been given into developing techniques to guide the optimization of fiber properties. The Scanning Electron Microscope (SEM) and X-ray Diffractometer (XRD) have been used to help collate the method of synthesis, crystal structure and surface morphology with physical performance parameters. As a result, progress has been made in characterizing such materials. This increased understanding makes the previous research worthy of further study. Author

N83-13182# Lockheed-California Co., Burbank.
TRANSVERSE SHEAR STIFFNESS OF T300/5208 GRAPHITE-EPOXY IN SIMPLE BENDING Progress Report, 1980 - 1981
Paul E. Sandorff 30 Nov. 1981 85 p refs
(AD-A118902; LR-29763) Avail: NTIS HC A05/MF A01 CSCL 11/4

Buckling and crippling of a structural element is governed by its elastic properties. Nevertheless, a complete definition of the elastic constants of a graphite/epoxy laminate, including the transverse shear moduli (important under high compressive stress), has never been accomplished. For this purpose, tension, compression, and bending tests were conducted on square-section specimens cut 0-degrees and 90-degrees to the fiber axis from 64-ply unidirectional T300/5208 laminate. Axial test specimens

were instrumented with tee gages to obtain data on extensional moduli and Poisson's ratios. Bending deflections were measured with high precision and analyzed using a rigorous finite difference solution for stress distribution to derive the shear moduli along with the extensional moduli acting in bending. Redundant determinations were obtained for the nine elastic constants of Hooke's law as generalized for specially orthotropic material. Extensional moduli obtained under axial load and in bending agreed with each other to within one percent. A self-consistent set of properties was determined which were generally in accordance with published data, and which established the material as being transversely isotropic and conforming to the linear theory of elasticity. GRA

N83-13183# California Univ., Livermore. Lawrence Livermore Lab.
LOCAL CHARACTERIZATION OF FIBER COMPOSITES BY ACOUSTIC EMISSION
M. A. Hamstad 25 Mar. 1981 16 p Presented at the Critical Rev.: Tech. for the Characterization of Composite Mater., Cambridge, Mass., 8-10 Jun. 1981; sponsored by ONR
(Contract W-7405-eng-48)
(DE82-003171; UCRL-85793; CONF-8106158-2) Avail: NTIS HC A02/MF A01

The performance of a fiber composite article is often critically dependent upon the local conditions throughout the composite. Local conditions include such items as matrix crack density, fiber damage or fraying, matrix content, matrix cure, moisture content, residual stress field, matrix to fiber bonding, etc. Without a proper characterization of those local conditions, analytical descriptions of composite performance and failure are inadequate. The local conditions of a composite article in service have been determined by two important factors. Namely, the local conditions that were originally fabricated and the modification of these conditions by the macroscopically distributed microfailure and deformation which occurred during proof testing and/or loading the composite article when it was put into service as well as the modification of these conditions during service life. Acoustic emission has demonstrated its usefulness as a tool for use in characterizing the original fabricated local conditions and in monitoring and characterizing the change in these conditions as a result of proof testing and service loading. DOE

N83-13184# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
REPORT ON THE STUDY OF THE DIMENSIONAL STABILITY OF CARBON FIBRE REINFORCED PLASTIC SKINNED HONEYCOMB CORED STRUCTURES
T. F. Keates, comp. and S. C. Ducker, comp. Paris ESA May 1982 129 p refs
(Contract ESA-4252/80/NL-AK)
(BAe-TP-7956; ESA-CR(P)-1616) Avail: NTIS HC A07/MF A01

The level of defects allowable without detrimentally affecting the dimensional stability of CFRP structures was studied. Modelling techniques for the properties of the structures and the residual stresses that occur as a result of laminating sequence and differential thermal expansions were developed. Tests were conducted to validate the theory and to assess the influence of selected defects and discontinuities on the dimensional stability. Good results are observed for Kevlar cored specimens in humidity and resin dry specimens in thermal cycling. The design of edge members is shown to be important to maintain integrity. A long term (20 weeks) exposure to a normal specimen in a normal working environment has little impact on specimen stability.
Author (ESA)

N83-13185# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
THE APPLICATION OF LANGMUIR'S MODEL TO WATER DIFFUSION IN EPOXY-CARBON COMPOSITES [LE MODELE DE LANGMUIR APPLIQUE A LA DIFFUSION D'EAU DANS LES MATERIAUX COMPOSITES TYPE CARBONE EPOXY]
J. N. Dewas 1 Jul. 1982 9 p refs In FRENCH Presented at A.M.A.C. Conf. Journees Natl. sur les Composites, 21 Sep. 1982
(SNIAS-822-551-102; C.44190) Avail: NTIS HC A02/MF A01

Langmuir's model was used to simulate mathematically the water absorption by the epoxy resin 5208 and the composite T300/5208. The model is more precise than Fiek's law and could be applied to the prediction of water absorption in critical composite components in the aerospace industry. An experimental study was also carried out, showing that the model accurately estimates the diffusion coefficient and the saturation level and that the anomalies experimentally observed at high temperatures are well explained. Discrepancies between the results with pure resin and composite are attributed to the existance of fiber-matrix interfaces in the composite. Author (ESA)

N83-13186# Rolls-Royce Ltd., Derby (England).
THE TECHNOLOGICAL AND MECHANICAL PROPERTIES OF LIGHT-HARDENED LAMINATES
Jan Orlt, Jiri Pscheidt, and Zybnek Sucharda, ed. May 1982 10 p Transl. into ENGLISH from Plasty a Kauch (USSR), v. 18, no 8, 1981 p 236-238 Presented at Conf. on Resins, Usti nad Labem, USSR, 1981
(PNR-90142) Avail: NTIS HC A02/MF A01

Hardening of unsaturated polyester resins with the photosensitive system benzil-dimethylaniline is discussed. An RVIM 400 halogen discharge tube was used as light source. Technological aspects and mechanical properties of the prepared glass laminates are compared with those of thermally hardened laminates. A lower photosensitizer content (0.1%) improves the evenness and time of hardening throughout the thickness of the laminate, and increases the values of the mechanical properties. An exposure time of 120 min is sufficient to obtain optimal physical properties. Where thermal hardening off is also carried out, exposure time can be reduced by up to one quarter. Mechanical properties are superior to those of thermally hardened materials.
Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-13187* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STATIC CONTINUOUS ELECTROPHORESIS DEVICE Patent
Percy H. Rhodes, inventor (to NASA) Issued 9 Nov. 1982 8 p Filed 6 Oct. 1981 Supersedes N82-11147 (20 - 02, p 0162)
(NASA-Case-MFS-25306-1; US-Patent-4,358,358; US-Patent-Appl-SN-309293; US-Patent-Class-204-299R; US-Patent-Class-204-280R) Avail: US Patent and Trademark Office CSCL 07D

An apparatus is disclosed for carrying out a moving wall type electrophoresis process for separation of cellular particles. The apparatus includes a water-tight housing containing an electrolytic buffer solution. A separation chamber in the housing is defined by spaced opposed moving walls and spaced opposed side walls. Substrate assemblies, which support the moving wall include vacuum ports for positively sealing the moving walls against the substrate walls. Several suction conduits communicate with the suction ports and are arranged in the form of valleys in a grid plate. The raised land portion of the grid plat supports the substrate walls against deformation inwardly under suction. A cooling chamber is carried on the back side of plate. The apparatus also has tensioner means including roller and adjustment screws for maintaining the belts in position and a drive arrangement including an electric motor with a gear affixed to its output shaft. Electrode assemblies are disposed to provide the required electric field.
Official Gazette of the U.S. Patent and Trademark Office

N83-13188* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POLYVINYL ALCOHOL CROSS-LINKED WITH TWO ALDEHYDES Patent
Dean W. Sheibley, Lorra L. Rieker, Li-Chen Hsu, and Michelle A. Manzo, inventors (to NASA) Issued 2 Nov. 1982 6 p Filed 10 Jun. 1981 Supersedes N81-27279 (19 - 18, p 2459)
(NASA-Case-LEW-13504-1; US-Patent-4,357,402; US-Patent-Appl-SN-272234; US-Patent-Class-429-206; US-Patent-Class-264-104; US-Patent-Class-429-253; US-Patent-Class-525-61) Avail: US Patent and Trademark Office CSCL 07D

A film forming polyvinyl alcohol resin is admixed, in aqueous solution, with a dialdehyde crosslinking agent which is capable of crosslinking the polyvinyl alcohol resin and a water soluble acid aldehyde containing a reactive aldehyde group capable of reacting with hydroxyl groups in the polyvinyl alcohol resin and an ionizable acid hydrogen atom. The dialdehyde is present in an amount sufficient to react with from 1 to 20% by weight of the theoretical amount required to react with all of the hydroxyl groups of the polyvinyl alcohol. The amount of acid aldehyde is from 1 to 50% by weight, same basis, and is sufficient to reduce the pH of the aqueous admixture to 5 or less. The admixture is then formed into a desired physical shape, such as by casting a sheet or film, and the shaped material is then heated to simultaneously dry and crosslink the article.

Official Gazette of the U.S. Patent and Trademark Office

N83-13189*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COAL DESULFURIZATION BY CHLORINOLYSIS PRODUCTION AND COMBUSTION TEST EVALUATION OF PRODUCT COALS Final Report
John Kalvinskas and Dave Daly 30 Apr. 1982 71 p refs Sponsored by NASA
(Contract DE-AI01-77ET-12547)
(NASA-CR-169515; DOE/ET-12547/2; JPL-Pub-82-72; NAS 1.26:169515) Avail: NTIS HC A04/MF A01 CSCL 07D

Laboratory-scale screening tests were carried out on coal from Harrison County, Ohio to establish chlorination and hydrodesulfurization conditions for the batch reactor production of chlorinolysis and chlorinolysis-hydrodesulfurized coals. In addition, three bituminous coals, were treated on the lab scale by the chlorinolysis process to provide 39 to 62% desulfurization. Two bituminous coals and one subbituminous coal were then produced in 11 to 15 pound lots as chlorinolysis and hydrodesulfurized coals. The chlorinolysis coals had a desulfurization of 29-69%, reductions in voltatiles and hydrogen. Hydrodesulfurization provided a much greater desulfurization (56-86%), reductions in volatiles and hydrogen. The three coals were combustion tested in the Penn State "plane flame furnace" to determine ignition and burning characteristics. All three coals burned well to completion as: raw coals, chlorinolysis processed coals, and hydrodesulfurized coals. The hydrodesulfurized coals experienced greater ignition delays and reduced burning rates than the other coals because of the reduced volatile content. It is thought that the increased open pore volume in the desulfurized-devolatilized coals compensates in part for the decreased volatiles effect on ignition and burning.

Author

N83-13190# New South Wales Univ., Kensington (Australia).
OXIDATION REACTIONS OF HETEROCYCLIC COMPOUNDS WITH LEAD TETRAACETATE M.S. Thesis
Dipl. Sumantri Jan. 1981 102 p refs
Avail: NTIS HC A06/MF A01

An investigation of the reactivity of various heterocyclic compounds to oxidation with lead tetra acetate is described. Benzimidazole is slowly oxidized by the reagent to give 2-acetoxybenzimidazole, 2-benzimidazolone, N,N'-diacetyl-o-phenylene diamine and other minor products. These products result from initial attack by the reagent at position 2 of the ring system and mechanisms to explain their formation are suggested. The reactivity of position 2 is further illustrated by attempted oxidation of 2-methyl benzimidazole which was inert. Further oxidation of 2-benzimidazolone gave 5,6-dihydro benzimidazol-2,5,6-trione. Benzothiazole was very unreactive towards lead tetra acetate and only a trace of 2-benzothiazolone was formed. 2-ethyl benzothiazole was completely unreactive. Benzoaxazole showed much higher reactivity and a variety of products were identified, consistent with initial attack by the reagent at both position 2 and position 5(6) of the ring. Some dimeric and ring opened products were also obtained. Reactivity of the ring system was reduced by substitution of a methyl group at position 2 and blocked by a phenyl group at C-2.

Author

N83-13191# California Univ., Livermore. Lawrence Livermore Lab.
DETONATION CHEMISTRY: AN INVESTIGATION OF FLUORINE AS AN OXIDIZING MOIETY IN EXPLOSIVES
R. R. McGuire, D. L. Ornellas, F. H. Helm, C. L. Coon, and M. Finger 7 Jul. 1982 38 p refs
(Contracts N00014-77-F-0053; W-7405-eng-48)
(AD-A119092; UCID-19430) Avail: NTIS HC A03/MF A01 CSCL 19/1

This report investigated the use of fluorine in the form of the difluoramino (NF2) group as an oxidizing moiety. Bis- and tris-difluoramino perfluorobutane, previously unknown, were especially synthesized for this study. Detonation calorimetry was performed to determine the exact detonation product composition and the hast of detonation of a series of NF2 compounds and mixtures. Cylinder tests were then performed to determine their detonation performance. Similar tests on NO2 compounds were used for comparison. For reasons of toxicity and safety, remote mixing and loading apparati were designed and built for certain of the materials. Materials were chosen to highlight certain of the detonation products. Hydrogen fluoride was found to be a favorable detonation product compared with H2O, CO2 outperforms CF4 at all cylinder expansion ratios, and Al2O3 was a favorable detonation product compared to AlF3. The most important result is the better understanding of the mechanism of reaction of small-particle aluminum in a detonation. GRA

N83-13192# Giner, Inc., Waltham, Mass.
A NEW CARBON DIOXIDE SENSING METHOD SUITABLE FOR USE IN MICROELECTRODE SENSORS Final Report, 1 Mar. - 31 Jul. 1982
David Wong and Jose Giner Aug. 1982 39 p refs
(Contract N00014-82-C-0285)
(AD-A118951) Avail: NTIS HC A03/MF A01 CSCL 09/1

Present electrochemical CO2-sensors are basically modified pH-electrodes; the operating principle of which is based on the measurement of a potential that is effectively a linear function of the logarithm of H+ ion concentration. The relationship between pH and PCO2 is delta pH = 0.97 delta log 10PCO2. Since one unit of pH at room temperature corresponds to less than 60 mV potential change, it is obvious that the PCO2 measurement is intrinsically inaccurate. In addition, this method is not conductive to miniaturization and it is susceptible to the same basic problems associated with the pH-electrode, i.e. low sensitivity, slow response and considerable drift. The feasibility of developing a new electrochemical carbon dioxide sensing method based on the reductive adsorption of CO2 onto a noble metal electrode and the subsequent anodic oxidation of the 'Reduced-CO2' species has been investigated experimentally. It was established that under proper conditions the presence of oxygen does not interfere with the measurement of CO2 concentration. GRA

N83-13193# Air Force Academy, Colo.
PROTON NMR STUDIES OF ROOM TEMPERATURE MOLTEN SALTS Interim Technical Report, Jun 1981 - May 1982
John S. Wilkes, J. Lloyd Pflug, Joseph A. Levisky, Charles L. Hussey, and Armand A. Fannin Jun. 1982 30 p refs
(AF Proj. 2303)
(AD-A119247; FJSRL-TR-82-0005) Avail: NTIS HC A03/MF A01 CSCL 07/4

Mixtures of 1-(1-butyl)pyridinium chloride or 1-methyl-3-

ethylimidazolium chloride with aluminum chloride are liquid at room temperature. The chemical shifts of protons on the cations of the melts are highly dependent on the proportions of aluminum chloride and organic chloride salt. The largest effect is in the basic melts, where there is an excess of organic chloride over aluminum chloride. The chemical shift behavior may be explained by assuming that the anions in the melt affect the chemical shift of the cation hydrogens and that the anions and cations interact in the fast exchange regime on the NMR time scale. The model implies that the melts are relatively organized in the liquid state, especially basic compositions. The addition of LiCl or nonelectrolyte solvents to binary aluminum chloride-imidazolium or -pyridinium chloride mixtures also affects chemical shifts of the cation protons.

Author (GRA)

N83-13194# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials.

MECHANISM OF GAS PERMEATION THROUGH POLYMER MEMBRANES. PART 1: PURE GASES Progress Report

S. A. Stern, S. S. Kulkarni, and G. R. Mauze Jul. 1982 185 p refs

(Contract DE-AC02-78ER-05015)

(DE82-019917; DOE/ER-05015/4-Pt-1) Avail: NTIS HC A09/MF A01

The validity of a free volume model of gas permeation through nonporous polymer membranes is assessed. This model provides a formalism for the prediction of permeability coefficients for pure gaseous penetrants and their mixtures as a function of both pressure and temperature. Such information is of great importance for the development of new, energy efficient membrane processes for the separation of gas mixtures. Diffusion and solubility coefficients for Ar, CO2, CH4, C2H4, C3H8, and SF6 in polyethylene membranes and rods were measured in the temperature range from 50 to 500 C and at pressures up to 40 atm. under isothermal isobaric conditions. It was found that the dependence of the diffusion and permeability coefficients on penetrant gas pressure and on temperature is satisfactorily represented by Fujita's free volume model for the transport of small molecules in polymers and by its extension to gas permeation. The free volume model of gas permeation relates permeability coefficients for gases in polymers to three thermodynamic variables, namely, temperature, pressure, and penetrant concentration, and to three characteristic parameters denoted A sub d, B sub d, and BETA. Semi-empirical correlations were developed for these parameters as a function of physiochemical properties of the penetrant and the polymer. These correlations were obeyed by the gas polyethylene systems studied. A generalized correlation was found for B sub d values of penetrants of various molecular sizes in polyethylene, polybutadiene, polyvinyl acetate, polymethyl acrylate, silicone rubber, and natural rubber. DOE

N83-13195# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials.

MECHANISM OF GAS PERMEATATION THROUGH POLYMER MEMBRANES. PART 2: GAS MIXTURES Progress Report

S. A. Stern, G. R. Mauze, and S. S Kulkarni Jul. 1982 48 p refs

(Contract DE-AC02-78ER-05015)

(DE82-019918; DOE/ER-05015/4-Pt-2) Avail: NTIS HC A03/MF A01

The validity of a free volume model for the permeation of mixtures is assessed. This model provides a formalism for the prediction of permeability coefficients for the components of permeating mixtures, as well as of the dependence of these coefficients on pressure and temperature. Steady state permeability coefficients were measured for equimolar mixtures of CO2-C2H4, CO2-C3H8, and C2H4-C3H8, as well as for a mixture of 74.9 mole% CO2-25.1 mole% C2H4, in polyethylene membranes. The measurements were made at 200, 350, and 500 C and at pressures of up to 18 atm. In all cases, the permeability coefficients for the components of these mixtures were higher, and in some cases considerably higher, than the permeability coefficients for the pure components at comparable partial pressures and temperatures. Each component of the binary mixtures studied thus had the effect of increasing the permeability coefficients for the other components. Furthermore, at equal partial pressures and at the same temperature, the component exhibiting the highest solubility in the polymer had the largest effect in increasing the permeability coefficient of the other component. This behavior is in complete agreement with the predictions of the free volume model for mixtures. From a quantitative viewpoint, the permeability coefficients for the components of the mixtures agreed, on the average, to better than 25% with the experimental values, the former being usually lower than the latter. The theoretical permeability coefficients can be estimated from the model using parameters determined with the pure components only. The extension of the model to multicomponent mixtures is straightforward. DOE

N83-13196# Department of Energy, Pittsburgh, Pa. Energy Technology Center.

STUDY OF THE FISCHER-TROPSCH REACTION USING ON-LINE GAS-CHROMATOGRAPHIC ANALYSIS

Richard A. Diffenbach, Thomas H. Johnson, and Richard R. Schehl Jul. 1982 37 p refs

(DE82-019142; DOE/PETC/TR-82/10) Avail: NTIS HC A03/MF A01

An on-line gas-chromatographic method was used to analyze the products obtained during the course of a Fischer-Tropsch reaction. The utility of this method for investigating catalyst activity and selectivity throughout the catalyst lifetime is illustrated. The variation in product composition with different reaction parameters has been demonstrated. The adherence of a classical Fischer-Tropsch iron catalyst to Anderson-Schulz-Flory kinetics can be illustrated under a variety of reaction conditions. DOE

N83-13197# Brookhaven National Lab., Upton, N. Y.

FLASH HYDROPYROLYSIS OF COAL FOR CONVERSION TO LIQUID AND GASEOUS FUELS

M. S. Sundaram, M. Steinberg, and P. T. Fallon May 1982 97 p refs

(Contract DE-AC02-76CH-00016)

(DE82-019435; DOE/METC-82-48) Avail: NTIS HC A05/MF A01

Process chemistry and design information for production of both liquid and gaseous fuels from coal was obtained. In particular, the products and correlation of the product yields as a function of pressure, temperature, and coal residence time in the flash hydropyrolyzer, was performed, and then this information was combined with the kinetic data to develop a reaction model. A parametric study of the flash hydropyrolysis was made with different coal types. Appropriate reactor conditions for maximizing either liquid or gaseous products were determined. The components in the heavier liquids were identified, and nitrogen and sulfur balances were made on the coal, the char products, and both the liquid and the gaseous effluents. From a detailed analysis of data, a reaction scheme for the flash hydropyrolysis of coal was proposed, for which reaction rate constants were determined and a kinetic model was developed. This information was applied to a conceptual full scale process design, and comparative economic estimates were made. The results indicate that the coals tested can be successfully converted to produce clean gaseous and liquid fuels via flash hydropyrolysis. Two features of this process - its being noncatalytic and its using direct hydrogenation in one step to liquid distillates - tend to improve the efficiency and reduce capital and operating costs. The process can be made to produce either gaseous or liquid fuels, or both, by adjusting the reactor and process design conditions. DOE

N83-13198# Ames Lab., Iowa.

BONDING IN HYDROGENATED AMORPHOUS SILICON

H. R. Shanks, F. R. Jeffrey, and M. E. Lowry Jul. 1981 6 p refs Presented at the 9th Intern. Conf. on Liquid and Amorphous Semicond., Grenoble, France, 2 Jul. 1981

(Contract W-7405-eng-82)

(DE82-003105; IS-M-344; CONF-810719-3) Avail: NTIS

HC A02/MF A01

A model for the H distribution and bonding structure in a Si:H is presented based on new NMR and ir absorption data. The model is capable of explaining previous discrepancies in the interpretation of the ir absorption data without including oscillator strengths which vary with H density. Three types of H distributions are considered. First, the typical SiH2 form which has a stretching mode at 2100/cm and a bending mode at 890/cm is included. Additionally, two distributions of Si-H bonds are included; a dilute, random distribution which has an ir stretching mode at 2000/cm and a cluster form which has its ir stretching mode near 2090/cm. Local H densities and sample wide average H densities for these two forms of Si-H bonds are determined from the NMR spectrum. This NMR data is correlated with the ir absorption data to calculate a fixed oscillator strength for each of the three types of H distribution. DOE

N83-13199# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Genie Radioactif.

CHROMATOGRAPHIC STUDIES OF THE LANTHANIDE ELEMENT SEPARATION FOR THE AMERICIUM/CURIUM LARGE SCALE SEPARATION USING ION EXCHANGE RESINS

Claude Ginisty Jun. 1981 155 p refs In FRENCH; ENGLISH summary

(DE81-700647; CEA-R-5107) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

The Am/Cm large scale separations, operated by chromatography with the use of ion exchange resins, are described. Use of sulfonate cationic resins; development by elution with the alpha hydroxyisobutyric acid; column loadings between 1 and 30% of the capacity; and possibility of using nonradioactive lanthanides prior to actinides for trial purposes are considered. A definition for the resolution, for nonsymmetrical elution peaks is introduced, and a measure of this dissymmetry is realized by introducing a shape factor F. For the separation itself and for the pressure drop in the column, the influence of the following parameters are studied: composition of the elution solution (concentration and pH), column temperature (20 to 90 C), resin size (9 to 27 microns), rate flow of mobile phase (70 ml. .02cm .1mn), column length and diameter. Symmetrical elution peaks may be obtained, even with a 27% loading. DOE

N83-13200# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

NEW MASS SPECTROMETERS FOR HYDROGEN ISOTOPE ANALYSES

P. Chastagner, Harold L. Daves, and W. Bascom Hess 1981 22 p Presented at the 25th Conf. on Anal. Chem. and Nucl. Technol., Gatlinburg, Tenn., 6-8 Oct. 1981

(Contract DE-AC09-76SR-00001)

(DE82-001828; DP-MS-81-30; CONF-811025-13) Avail: NTIS HC A02/MF A01

Two advanced mass spectrometers for the accurate analysis of mixtures of the hydrogen isotopes are being evaluated by Du Pont personnel at the Savannah River Laboratory. One is a large double-focusing instrument with a resolution of 2000 at mass 4, an abundance sensitivity of greater than 100,000 for the HT-D2 doublet, and a sophisticated electronic control and data collection system. The second is a smaller, simpler, stigmatic-focusing instrument in which exceptionally high ion intensities result in high signal to noise ratios. A containment facility with sample inlet systems and a standard distribution system was built to permit testing with tritium mixtures. The characteristics of the mass spectrometers under a variety of operating conditions will be presented. Factors to be discussed include: sample equilibration and its elimination; linearity; trimer formation; gas interference; stability; signal to noise ratio; mass discrimination. DOE

N83-13201# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

RAPID SCANNING SPECTROPHOTOMETRIC STUDY OF THE TRANSIENT SPECIES FORMED DURING THE REDUCTION OF URANYL ION BY HYDROXYMETHANE SULPHINATE ION (RONGALITE) IN PERCHLORATE MEDIUM

C. Ladirat and C. Madic May 1981 26 p Presented at the Meeting on Actinides, Jesole Lido, Italy, 25 May 1981

(DE81-700646; CEA-Conf-5764; CONF-8105122-2) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Sodium hydroxymethane sulfinate (Rongalite) is a powerful reducing agent allowing quantitative reduction of U(VI) to U(IV). The addition of Rongalite to acid aqueous solutions of U(VI) causes first the appearance of an intense reddish-brown color, then the solution gradually turns green (U(IV)). The nature of species responsible of this transient color was studied by rapid scanning spectrophotometry. Absorption spectrum measured a few seconds after the addition of Rongalite in the perchloric aqueous solution of uranium (VI) shows an band at lambda < or = 500 nm masking absorption peaks of UO2(2+) ion. Moreover absorption peaks of U(IV) are not observed immediately. This transient color is due to the complexation of uranyl ion by hydroxymethane sulfinate ion. Study of this reaction in (H(+), Na(+)) ClO4(-) medium, pH = 1.5 to 3, at room temperature, shows that two complexes are formed: UO2 (HO CH2 SO2)(+) UO2(HO CH2 SO2)2. DOE

N83-13202# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

EXPERIMENTATION FOR THE PRODUCTION OF NaCl AEROSOLS IN GASEOUS PHASE Thesis [EXPERIMENTE ZUR ERZEUGUNG VON NaC-AEROSOLEN AUS DER DAMPFPHASE]

George Kettmann May 1982 83 p refs In GERMAN

(MPIS-7/1982; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,25

An aerosol generator, consisting of a high temperature furnace with temperature control, containing a closed crucible filled with liquid NaCl to a height of 9 mm and with Al2O3 insulation beads to a height of 25 mm from the bottom in which a variable flow of nitrogen is injected and where the gas containing aerosol leaves the crucible through a 10 mm diameter pipe, was constructed. By adjusting the three parameters, i.e., temperature in crucible, gas flow, and position of crucible in furnace, dense particles were produced. Particle size has a normal distribution and particles have a conical shape so that they can be used for laser Doppler anemometry. Dimensions and density of particles are determined by electron microscopy. It is stated that particle radius diminishes with lower gas flow and with increasing NaCl temperature, and that the radius dispersion increases with smaller radius. The loss of particles in gas flow, is bounded to an electrophoresis phenomenon. By heating up the gas and by injecting in counterflow of the escaping gaseous phase a cold gas, coagulation rate and losses by electrophoresis can be decreased. Author (ESA)

N83-13203# Stockholm Univ. (Sweden). Dept. of Meteorology.

AUTOMATIC SPECTROPHOTOMETRIC DETERMINATION OF SULFATE WITH THE THORIN METHOD

Claes Traegaardh and Lennart Granat 23 Mar. 1982 24 p refs Sponsored by Swedish National Environment Protection Board and Swedish National Science Research Council

(AC-37) Avail: NTIS HC A02/MF A01

An automatic method for determination of sulfate, used for rain and air sample analysis is described. It is based on precipitation of sulfate with barium. Thorin is used as reagent for excess Ba2+ and the absorption of the complex formed is measured spectrophotometrically at 520 nm. Suitable concentration range is 0.03 to 3 mg S/l. Author (ESA)

N83-13204# National Bureau of Standards, Washington, D.C.

THERMOPHYSICAL PROPERTIES OF ISOBUTANE FROM 114 TO 700 K AT PRESSURES TO 70 MPa

Robert D. Goodwin and William M. Haynes Jan. 1982 198 p refs

(PB82-225988; NBS-TN-1051) Avail: NTIS HC A09/MF A01 CSCL 07D

Using a modified version of the nonanalytical equation of state, thermophysical properties of isobutane are derived from physical properties data and are tabulated at integral temperatures over the entire range of fluid states from 114 to 700 K along isobars

at pressures to 70 MPa. Results include dielectric constants, densities, enthalpies, entropies, equation of state, internal energies, isobars, isochores, isotherms, Joule- Thomson inversion, heats of vaporization, melting line, orthobaric densities, specific heats, sound velocities, vapor pressures, and virial coefficients. In addition to the equation of state, equations are given for vapor pressures, orthobaric vapor and liquid densities, ideal gas properties, second virial coefficients, dielectric constants, heats of vaporization, melting pressures, and orthobaric liquid specific heats, enthalpies, and entropies. GRA

N83-13205# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Technology Div.
PATH-LENGTH SENSITIVITY OF THE LYMAN-ALPHA HUMIDIOMETER
Carl A. Friehe Mar. 1982 12 p refs
(Grant NSF ATM-77-23757)
(PB82-225624; NCAR/TN-190) Avail: NTIS HC A02/MF A01 CSCL 07D

The Lyman-alpha humidiometer, often used for the measurement of humidity fluctuations in the atmosphere is discussed. The device is based on the absorption of a specific wavelength of light in the vacuum ultraviolet (the Lyman-alpha line, 1215 A) by molecular hydrogen in water vapor in the air. Lyman-alpha radiation is usually generated by glow discharge or radio frequency excited hydrogen tubes, and detected by nitrous oxide or photomultiplier tubes. Lithium or magnesium fluoride tube windows are used to pass the Lyman-alpha radiation to the atmospheric path. GRA

N83-13206# California Univ., Santa Barbara. Dept. of Physics.
THEORETICAL RESEARCH ON SURFACE BONDING AND STRUCTURE Annual Report, 1 Jan. - 31 Dec. 1982
J. R. Schrieffer Apr. 1982 16 p refs Sponsored by Gas Research Inst., Chicago
(PB82-243783; GRI-81/10056) Avail: NTIS HC A02/MF A01 CSCL 07D

The development of experimental and theoretical methods for determining the strength and geometric structure of bonding at clean surfaces and between surfaces and chemisorbed overlayers was investigated. One spectroscopy which is directly related to bonding was developed. The spectroscopy is inelastic high energy charged particle scattering. It is found that high energy electron photoemission spectroscopy is related by a sum rule to binding. GRA

N83-13207# Bureau of Mines, Pittsburgh, Pa. Research Center.
SUPERHEATED DROP VAPORIZATION: HALON 1301
John C. Edwards and Henry E. Perlee May 1982 25 p refs
(PB82-233727; BM-8658; LC-82-600004) Avail: NTIS HC A02/MF A01 CSCL 07D

The Bureau of Mines developed a time-dependent droplet vaporization model (in the absence of forced convection) that can be applied to the vaporization of liquid Halon 1301 droplets (vapor pressure at 300 K = 14 atm) sprayed from an extinguisher. It was found that rapid surface vaporization quickly lowers the droplets' surface temperature very near to the boiling temperature, and the vaporization becomes diffusion controlled. Although the lifetime of the droplet is proportional to the square of the initial radius of the droplet, the elapsed time prior to complete droplet vaporization is not proportional to the square of the droplet radius, as an equilibrium model would indicate. GRA

N83-13208# Little (Arthur D.), Inc., Cambridge, Mass.
FURTHER CHARACTERIZATION OF SORBENTS FOR ENVIRONMENTAL SAMPLING, 2 Final Report, May 1979 - Aug. 1981
J. C. Harris, E. V. Miseo, and J. F. Piecewicz Jun. 1982 47 p refs
(Contract EPA-68-02-3111)
(PB82-234667; IERL-RTP-1304; EPA-600/7-82-052) Avail: NTIS HC A03/MF A01 CSCL 07D

Characterization data related to the use of sorbents for emissions sampling are presented. Retention and recovery data for several sorbates on XAD-2, XAD-7, Tenax-GC, Ambersorb XE-340, and Florisil are provided. Retention properties of two organometallic compounds are given, and the effect of methane in a sample stream is shown. Mixed sorbent effects are shown to be negligible over all conditions studied. GRA

N83-13209# Council for Scientific and Industrial Research, Pretoria (South Africa). Chemical Engineering Group.
THERMAL CONDUCTIVITY OF LIQUIDS USING THE TRANSIENT HOT-WIRE METHOD
P. G. Knibbe Mar. 1982 34 p refs
(PB82-239864; CSIR-CENG-414; ISBN-0-7988-2418-2) Avail: NTIS HC A03/MF A01 CSCL 07D

The transient hot-wire method for measuring the thermal conductivity of a liquid has become the generally accepted technique; its theory is presented. The experimental improvements introduced by Raal et al. and the author are described. A new measurement procedure which improves the quality of the measurements by ensuring equal rates of heat production per unit length in both measuring and reference cells at all temperatures is presented. The interpretation of the results can also provide information on the thermal diffusivity. GRA

N83-13210# Bureau of Mines, Reno, Nev.
HYDROGENATION CATALYSTS FROM INTERMETALLIC COMPOUNDS
G. Atkinson, L. J. Nicks, E. G. Baglin, and D. J. Bauer Apr. 1982 14 p refs
(PB82-220245; BM-RI-8631; LC-81-607791) Avail: NTIS HC A02/MF A01 CSCL 07D

Properties of catalysts prepared from intermetallic compound precursors were investigated as part of its mission to decrease U.S. dependence on foreign sources for scarce catalytic materials, such as nickel, cobalt, and chromium. Methods were developed whereby catalysts with surface areas of 30 to 40 sq m/g were prepared from intermetallic compounds. Activity of these catalysts for the methanation reaction and methanol synthesis was determined using a fixed-bed, single-pass, flow-through reactor. GRA

N83-13211# Bureau of Mines, Albany, Oreg.
THERMODYNAMICS OF CALCINATION OF CALCITE
H. C. Ko, N. Ahmad, and Y. A. Chang Apr. 1982 15 p refs
(PB82-220260; BM-RI-8647; LC-81-607568) Avail: NTIS HC A02/MF A01 CSCL 07D

Heats of solution of calcium carbonate (calcite) and calcium oxide in hydrochloric acid were determined by solution calorimetry. GRA

N83-13212# Kentucky Univ., Lexington. Water Resources Research Inst.
LOW PRESSURE MEMBRANE SEPARATION PROCESS TO REMOVE HEAVY METAL COMPLEXES
Dibakar Bhattacharyya and Ching-Shun Cheng 1981 145 p refs (Contract DI-14-34-0001-9073)
(PB82-224619; W82-05284; OWRT-B-059-KY(1); RR-129) Avail: NTIS HC A07/MF A01 CSCL 07D

The rejection behavior of heavy metals was established in the presence of complexing agents, utilizing negatively charged ultrafiltration membranes. An extensive experimental investigation was conducted with Zn, Cd, and Cu, in the presence of cyanide, ethylenediamine tetraacetic acid, and oxalates, under insignificant concentration polarization condition. GRA

N83-13213# Maryland Univ., College Park. Dept. of Chemistry.
ION HYDRATION AND ION INTERACTION Final Technical Report
Gordon Atkinson Oct. 1981 25 p refs
(Contract DI-14-01-0001-1656)
(PB82-224841; W82-05310; OWRT-(1656(1)) Avail: NTIS HC A02/MF A01 CSCL 07D

A summary is provided on research which was undertaken to define the nature and properties of aqueous ionic species and to

understand the relationship between individual ion hydration and classical thermodynamic properties. The research, experimentally, relied heavily on relaxation methods (particularly, ultrasonic absorption (UA) to bridge the gap between dynamic processes and equilibrium considerations. Studies with UA were made on aqueous solutions of tetraalkylammonium halide salts as a function of concentration and temperature. Combining the UA results with dielectric relaxation and equilibrium thermodynamics made it possible to quantitatively describe such systems in terms of the coupled equilibium processes. GRA

N83-13214# National Center for Atmospheric Research, Boulder, Colo.
A STUDY OF AEROSOL ACIDITY OVER THE NORTHEASTERN UNITED STATES Ph.D. Thesis
Ronald John Ferek 1982 166 p refs
(Grant NSF ATM-77-23757)
(PB82-225582; NCAR-CT-68) Avail: NTIS HC A08/MF A01 CSCL 07D

Ambient sulfate aerosols are composed of sulfuric acid, ammonium sulfate, or other sulfate salt mixtures, and the term 'total sulfate' includes these substances of diverse chemical and physical properties. Measurements of total sulfate are often made, but without measurements of the associated cations they are inadequate to assess the contribution of aerosols to acid rain, damage to surfaces, heterogeneous oxidation of SO2, and human health effects. The chemical properties of sulfate aerosols were investigated in the northeastern U.S. by measurements of acidity, ionic composition, and particle morphology over a range of conditions. GRA

N83-13215# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
INDIVIDUAL BURN FUEL/AIR RATIO CONTROL OPTICAL ADAPTIVE FEEDBACK CONTROL SYSTEM Final Report
Janos M. Beer, Malcolm T. Jacques, and J. Derek Teare Jan. 1982 77 p refs Sponsored in part by Northeast Utilities Service Co., Boston Edison Co., Consolidated Edison Co. of New York, Inc., Public Service Electric and Gas Co. and New England Electric Co.
(PB82-229667; MIT/EL-82-001) Avail: NTIS HC A05/MF A01 CSCL 21B

A property of an individual flame which can be reliably interpreted as an indicator of the flame behavior over a wide range of operating conditions is investigated. The acoustic characteristics of the flame, the local distribution of key chemical species, or the electromagnetic radiation or absorption behavior of regions of the flame are considered. GRA

N83-13216# National Bureau of Standards, Washington, D.C. Engineering Lab.
FIRE ENDURANCE TESTS OF SELECTED RESIDENTIAL FLOOR CONSTRUCTION
Jin B. Fang May 1982 115 p refs Sponsored in part by HUD
(PB82-225079; NBSIR-82-2488) Avail: NTIS HC A06/MF A01 CSCL 13M

A series of 10 load-bearing, wood- and steel-framed residential floors was evaluated for structural fire resistance in a fire endurance furnace. Nine woodframe and one light gauge steel-frame, protected and unprotected floor/ceiling assemblies, each measuring 3.05 by 2.44 m in size, were exposed from the underside to either the newly developed high-intensity, short-duration fire exposure or time-temperature curve. The fire endurance time based on the passage of flames to the unexposed face of the floor with unprotected wood joists varied from 6 to 9 minutes under the newly developed fire exposure and 16 to 18 minutes subject to the standard fire. GRA

N83-13217# American Gas Association Labs., Cleveland, Ohio.
COMMERCIALIZATION OF A PULSE COMBUSTION FURNACE WITH ULTRAHIGH EFFICIENCY Final Annual Report, Jan. - Dec. 1980
F. E. Belles and J. C. Griffiths Chicago GRI Feb. 1982 79 p
(Contract GRI-5014-341-0112)
(PB82-243809; GRI-80/0131) Avail: NTIS HC A05/MF A01 CSCL 13M

The development of pulse combustion technology, with specific application to furnaces with ultrahigh efficiency is discussed. A nationwide field test of 10 prototype pulse combustion furnaces was conducted which indicated savings ranging from 13 to 46 percent over conventional furnaces alternately operated with the pulse furnaces at the sites for comparison purposes.GRA

N83-13218# Science Applications, Inc., Chatsworth, Calif. Combustion Science and Advanced Technology Dept.
COMBUSTION DIAGNOSTIC INSTRUMENTATION. PART 1. PROBE MEASUREMENTS Final Report, Sep. 1981 - Mar. 1982
Robert J. Pederson Chicago GRI Mar. 1982 86 p refs
(Contract GRI-5011-345-0100)
(PB82-240029; SAI-82-033-CHATS; GRI-81/0053.1) Avail: NTIS HC A05/MF A01 CSCL 14B

Probe measurement techniques and capabilities were reviewed with respect to measurements of temperature, pressure, velocity, and species concentrations in a combustion environment. Individual probe design, sources of measurement errors and methods for reducing these errors are discussed. Bare wire thermocouple measurement techniques are examined together with several types of water cooled aspirating thermocouple probes. Velocity measurements using unidirectional and multidirectional pneumatic probes are discussed, along with hot wire/hot film anemometers for measurement of turbulent intensity and stress components as well as mean velocity. Gas sampling techniques using isokinetic and aerodynamic quenching probes are surveyed for gas species concentrations. Instrumentation to determine convective and radiative heat transfer to the wall within a combustion environment is reviewed. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-13219 Iowa State Univ. of Science and Technology, Ames.
THE EFFECT OF STRESS ON THE TRANSFORMATION IN NICKEL-TITANIUM Ph.D. Thesis
Chuen-Hsuing Hsu 1982 137 p
Avail: Univ. Microfilms Order No. DA8224223

The shape of memory phase transformation in Ni-Ti was studied using tubes and wires of near equiatomic composition. The emphasis was on the effect of stress as produced by an applied uniaxial tensile stress and as a result of prior transformation fatigue cycling (cycling through the transformation under combined variations in temperature and stress). Measurements were made of strain and resistivity versus temperature and of tensile properties. The transformation volume change was also investigated at zero applied stress by hydrostatic weighing and strain gage measurement. The primary observation, made for both Ni-Ti tubes and wires, was that the axial transformation strain increases with increasing applied tensile stress. Dissert. Abstr.

N83-13220 Ohio State Univ., Columbus.
A STUDY OF THE CORROSION FATIGUE CRACK PROPAGATION OF A QUENCED AND TEMPERED AISI 403 STAINLESS STEEL IN BOILING DOUBLE DISTILLED WATER AND pH 12 SODIUM-HYDROXIDE AT 100 DEG C: A LOADING WAVEFORM AND APPLIED POTENTIAL INVESTIGATION Ph.D. Thesis
Robert Donald Mack 1982 374 p
Avail: Univ. Microfilms Order No. DA8222122

Cycle-based corrosion fatigue crack propagation rates were measured as a function of stress intensity range for quenched and tempered AISI 403 stainless steel compact tension specimens. All tests were performed at an R ratio of 0.5. The effect of loading waveform and cycling frequency upon the corrosion fatigue crack propagation rates of AISI 403 at open circuit in 25 and 100 C

double distilled water were investigated. The effect of applied potential and cycling frequency (using a sinusoidal loading waveform) were also investigated in 100 C, pH 12 NaOH. Scanning electron microscopic and optical fractography were performed on the fatigue-fracture surfaces from each test condition. Loading waveform and cycling frequency in distilled water had little effect upon the corrosion fatigue crack propagation rates of the AISI 403. Loading rise time was identified as the important parameter which appeared to determine the crack propagation rate. A model for the corrosion fatigue crack propagation was advanced. At the applied cathodic potentials, a hydrogen embrittlement mechanism dominates; at anodic applied potentials, an anodic dissolution mechanism dominates; and, at open circuit potential (freely corroding), a combination of the anodic and cathodic mechanisms produce corrosion fatigue. Dissert. Abstr.

N83-13221 Polytechnic Inst. of New York, Brooklyn.
EFFECTS OF MANGANESE ADDITION ON THE TRANSFORMATION BEHAVIOR OF NI-TI MEMORY ALLOYS Ph.D. Thesis
Sumalee Vongchan 1982 172 p
Avail: Univ. Microfilms Order No. DA8217352

The shape recovery transition temperature was controlled systematically by adding a ternary alloying element. A series of deoxidizing elements were considered. The most successful element was found to be Mn. The effects of manganese addition on the behavior of Ni-Ti alloy (Ni, 48 wt.% Ti) were investigated. Tension test, hardness test, dilatometric measurement, X-ray diffraction and transmission electron microscopy studies were conducted. A wide variation of mechanical properties with changing alloy composition and test temperature was observed. The alloys which contained less than or equal to 1.0 wt.% Mn showed a stress-assisted martensitic transformation at room temperature, while alloys which contained manganese greater than 1.0% Mn, showed stress-assisted martensitic transformation at temperatures below the ambient temperature. Dissert. Abstr.

N83-13222 Ohio State Univ., Columbus.
KINETICS OF HYDROGEN ATTACK IN A 1020 STEEL Ph.D. Thesis
Binayak Panda 1982 89 p
Avail: Univ. Microfilms Order No. DA8222152

Kinetics of methane bubble growth in a 1020 steel was studied with a sensitive dilatometer by exposing the steel to high temperature and high pressure hydrogen. Results are reported in the form of activation energies and pressure exponents to help understand the micromechanisms governing bubble growth driven by internal methane pressure. Results indicate that under low hydrogen pressure and high temperature the bubbles exhibit the usual spherical morphology and their growth is controlled by a mixed process of grain boundary diffusion and matrix creep. Under high hydrogen pressure and low temperature, the bubbles take a thin crack like shape; their growth being controlled by the diffusion of atoms along the bubble cavity surface. These crack like bubbles grow along the grain boundaries and their growth stops when they reach the triple points on the grain boundaries. Kinetics of their growth then changes to a power law matrix creep controlled process. Opposing forces for bubble growth were also investigated. Dissert. Abstr.

N83-13223 Rensselaer Polytechnic Inst., Troy, N. Y.
BRITTLE FRACTURE OF FERRITIC STAINLESS STEEL Ph.D. Thesis
John Frederick Gruss 1982 185 p
Avail: Univ. Microfilms Order No. DA8223320

The fundamental fracture behavior of several Fe-26% Cr alloys has been studied. Factors investigated include the state of carbon and nitrogen, grain size, welding, and cold work-recovery-recrystallization. General characterization included room temperature tensile testing, subsize (1.5 mm thick) Charpy impact DBTT testing, and conventional and electron metallography. Hall-Petch analyses were performed. Several material and heat treatment conditions were selected for study of microcrack initiation. To this end, electropolished specimens were tested to failure in the DBTT range and the surfaces were subsequently examined for microcracking. Microcrack initiation sites were identified and used as a basis for fracture initiation mechanism identification. A comprehensive assessment of fracture initiation sites operating in the Fe-26% Cr system has been set forth. Dissert. Abstr.

N83-13224 Rensselaer Polytechnic Inst., Troy, N. Y.
CRACK GROWTH IN MERCURY EMBRITTLED ALUMINUM ALLOYS UNDER CYCLIC AND STATIC LOADING CONDITIONS Ph.D. Thesis
Joseph Alexander Kapp 1982 173 p
Avail: Univ. Microfilms Order No. DA8223322

Crack growth rates were measured on three aluminum alloys under cyclic and static loading conditions in laboratory air and in liquid mercury at about + 25 C. One alloy, 6061-T651, was tested under both loading conditions at temperature ranging from -25 C to +45 C. Fracture mechanics techniques were used. Under cyclic loading conditions, no enhanced crack growth in mercury was measured until a critical stress intensity factor range (Delta K) was exceeded. When Delta K increased above the threshold value, the crack growth rate increased by as much as three orders of magnitude, when compared to the crack growth rate in air. From the appearance of the fracture surface the mechanism of embrittlement was deduced to be reduced cohension. Under static loading conditions, crack velocities of centimeters per second were measured in load control. Under displacement control much slower crack velocities were measured in two alloys. The decrease in crack velocity was attributed to crack blunting and large plastic zones. Static crack velocity and cyclic crack growth rate increased with decreasing temperature. This unusual temperature effect was related to the kinetics of adsorption of mercury on aluminum. Dissert. Abstr.

N83-13225 California Univ., Los Angeles.
OPTICAL PROPERTIES OF METAL ALLOYS DETERMINED BY WAVELENGTH: MODULATED DERIVATIVE SPECTROSCOPY Ph.D. Thesis
Ronald Childs Stearns 1982 240 p
Avail: Univ. Microfilms Order No. DA8219774

Wavelength-modulated derivative spectroscopy was used to give new insights into the optical properties of alloys which were unobtainable using conventional reflectivity techniques. A technique was developed for separating the intraband and interband contributions to the dielectric function which depends on the orthogonality of the functions describing the two parts. Beta'-Cu(x) An(1-x) was studied on both sides of the beta' to alpha + beta' phase transition. Significant changes in both the intraband and interband properties are seen as the transition is crossed. Changes in the fundamental absorption edge indicate that competing physical mechanisms account for the shifts in interband properties. The shift in the interband absorption edge in alpha - Ag70Zn30 is also included. With this amount of alloying the plasma resonance which dominates the spectrum of AG is eliminated. Observed shifts in interband absorption edge are consistent with a rigid-band interpretation for this degree of alloying. Dissert. Abstr.

N83-13226 National Physical Lab., Teddington (England). Div. of Materials Applications.
CATHODIC PROTECTION OF CREVICES OF THE STRUCTURAL STEEL BS 4360 50D IN 3.5% NaCl AND IN SEA WATER
A. Turnbull and A. T. May Jun. 1982 23 p refs
(NPL-DMA(A)-45; ISSN-0143-7313) Copyright. Avail: Issuing Activity

The cathodic protection of crevices of BS 4360 50D in 3.5% NaCl and in sea water at 18 and 5 C was investigated over a range of applied potential from -850mV to -1300mV. The crevice was formed between steel sections of length 240mm and the crevice gap was varied between 2 and 750 microns. Potential and pH measurements were made at three locations in the crevice which was open at both ends. The potential drop in the crevice (with respect to a reference electrode located in the bulk solution) is < 50mV at applied potentials > -1V, but increases significantly with lowering of the applied potential below this value. The crevice

pH under cathodic protection condition is in the range 9.5 to 13.5, depending on the applied potential. Author (ESA)

N83-13227# International Tin Research Inst., Middlesex (England).
TIN AND ITS USES, NO. 134
Colin J. Evans, ed. 1982 18 p refs
(ISSN-0040-7) Avail: NTIS HC A02/MF A01

Current projects in tin research are described together with a review of significant developments over the past fifty years. The use of tin additions to titanium alloys is considered as well as the historical role that this metal had played in photography, including the use of tin salts as reduction sensitizers in photographic emulsions. A specialized bearing metalling shop in Australia, an organization to promote the use of metal beverage cans in the U.K., soldering techniques, and the misleading term "cold cast bronze" in giftware and sculpture are discussed. A.R.H.

N83-13228*# Puerto Rico Univ., Mayaguez. Center for Energy and Environment Research.
OCEANIC CORROSION TEST OF BARE AND ZINC-PROTECTED ALUMINUM ALLOYS FOR SEAWATER HEAT EXCHANGERS Final Report
Donald S. Sasscer, Thomas O. Morgan, Carlos Rivera, Richard Ernst (Trane Co.), Arthur C. Scott (Kaiser Aluminum Chemical Corp.), and T. J. Summerson (Kaiser Aluminum Chemical Corp.) Nov. 1982 117 p refs
(Grant NAGw-198)
(NASA-CR-169523; NAS 1.26:169523) Avail: NTIS HC A06/MF A01 CSCL 11F

Bare 3004 tubes, 7072 Alclad 3004 tubes, and bare and zinc diffusion treated 3003 extrusions from a brazed aluminum, plate-fin heat exchanger were exposed to 1.8 m/sec flowing seawater aboard an open ocean test facility moored 3.4 km off the southeast coast of Puerto Rico. After six months exposure, the average corrosion rates for most varieties of aluminum materials converged to a low value of 0.015 mm/yr (0.6 mils/yr). Pitting did not occur in bare 3003 and 3004 samples during the six month test. Pitting did occur to varying degrees in the Alclad and zinc diffusion treated material, but did not penetrate to the base metal. Biofouling countermeasures (intermittent chlorination and brushing) did not affect the corrosion rates to any significant extent. Intermittent chlorination at a level of 0.5 ppm for 28 minutes daily controlled microbiofouling of the samples but did not prevent the development of a macrobiofouling community in areas of the plumbing with low flow. A.R.H.

N83-13229*# Southampton Univ. (England). Dept. of Mechanical Engineering.
THE PROBLEM OF DIMENSIONAL INSTABILITY IN AIRFOIL MODELS FOR CRYOGENIC WIND TUNNELS
D. A. Wigley Hampton, Va. NASA. Langley Research Center Sep. 1982 26 p refs Prepared for Kentron Technical Center, Hampton, Va.
(Contract NAS1-16000)
(NASA-CR-166003; NAS 1.26:166003) Avail: NTIS HC A03/MF A01 CSCL 11F

The problem of dimensional instability in airfoil models for cryogenic wind tunnels is discussed in terms of the various mechanisms that can be responsible. The interrelationship between metallurgical structure and possible dimensional instability in cryogenic usage is discussed for those steel alloys of most interest for wind tunnel model construction at this time. Other basic mechanisms responsible for setting up residual stress systems are discussed, together with ways in which their magnitude may be reduced by various elevated or low temperature thermal cycles. A standard specimen configuration is proposed for use in experimental investigations into the effects of machining, heat treatment, and other variables that influence the dimensional stability of the materials of interest. A brief classification of various materials in terms of their metallurgical structure and susceptability to dimensional instability is presented. Author

N83-13230*# Virginia Univ., Charlottesville. Dept. of Materials Science.
TERRESTRIAL GROWTH OF LEAD-TIN-TELLURIDE BY TECHNIQUES RELATED TO LOW G GROWTH Final Report
W. A. Jesser Oct. 1982 153 p refs
(Grant NsG-1652)
(NASA-CR-169541; NAS 1.26:169541; UVA/528185/MS82/101) Avail: NTIS HC A08/MF A01 CSCL 11F

A modified Bridgman-Stockbarger furnace was constructed for a study of the solidification of silver, germanium and lead-tin-telluride. The melt-solid interface position with respect to the furnace and its temperature profile was determined by measuring the discontinuity in the slope of temperature as a function of position in the melt and in the solid. The results show that the interface position of the semiconductors germanium and lead-tin-telluride was essentially constant with respect to the furnace and hence the growth rate was constant and equal to the sample translation rate of 0.046 cm/min and 0.178 cm/min in each case. The metal, silver, on the other hand showed a continuous interface migration toward the hot zone of the furnace and always exhibited a growth rate which was higher than the ampoule translation rate. The K sub L/K sub S ratio of lead-tin-telluride was determined to be 2.33 + or - 0.06 where K sub L,S denotes the thermal conductivity of the liquid, solid respectively. The value of K sub L was calculated to be about 0.054 Watt 0.1 cm 0.1 K. The diffusion boundary layer thickness was calculated for lead-tin-telluride to be about 0.05 cm using a liquid diffusivity of .00007 sq cm/sec. S.L.

N83-13231*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INITIAL STAGES OF CAVITATION DAMAGE AND EROSION ON COPPER AND BRASS TESTED IN A ROTATING DISK DEVICE
P. Veerabhadra Rao, B. C. Syamala Rao, and N. S. Lakshmana Rao (Indian Inst. of Science) 1982 16 p refs Presented at the Cavitation and Polyphase Flow Forum, St. Louis, Mo., 7-11 Jun. 1982
(NASA-TM-82993; E-1424; NAS 1.15:82993) Avail: NTIS HC A02/MF A01 CSCL 11F

In view of the differences in flow and experimental conditions, there has been a continuing debate as to whether or not the ultrasonic method of producing cavitation damage is similar to the damage occurring in cavitating flow systems, namely, venturi and rotating disk devices. In this paper, the progress of cavitation damage during incubation periods on polycrystalline copper and brass tested in a rotating disk device is presented. The results indicate several similarities and differences in the damage mechanism encountered in a rotating disk device (which simulates field rotary devices) and a magnetostriction apparatus. The macroscopic erosion appears similar to that in the vibratory device except for nonuniform erosion and apparent plastic flow during the initial damage phase. Author

N83-13232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF DOPANTS IN HYDROGEN TO REDUCE HYDROGEN PERMEATION IN CANDIDATE STIRLING ENGINE HEATER HEAD TUBE ALLOYS AT 760 DEG AND 820 DEG
John A. Misencik Oct. 1982 32 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-82920; DOE/NASA/51040-41; R-1309; NAS 1.15:82920) Avail: NTIS HC A03/MF A01 CSCL 11F

Alloy tubes filled with hydrogen doped with various amounts of carbon monoxide, carbon dioxide, ethane, ethylene, methane, ammonia, or water were heated in a diesel fuel-fired Stirling engine simulator materials test rig for 100 hours at 21 MPa and 760 or 820 C to determine the effectiveness of the dopants in reducing hydrogen permeation through the hot tube walls. Ultra high purity (UHP) hydrogen was used for comparison. The tube alloys were N-155, A-286, Incoloy 800, Nitronic 40, 19-9DL, 316 stainless steel, Inconel 718, and HS-188. Carbon dioxide and carbon monoxide in the concentration range 0.2 to 5 vol % were most effective in

reducing hydrogen permeation through the hot tube walls for all alloys. Ethane, ethylene, methane, ammonia, and water at the concentrations investigated were not effective in reducing the permeation below that achieved with UHP hydrogen. One series of tests were conducted with UHP hydrogen in carburized tubes. Carburization of the tubes prior to exposure reduced permeation to values similar to those for carbon monoxide; however, carbon dioxide was the most effective dopant. Author

N83-13233*# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
THE ORTHOGONAL IN-SITU MACHINING OF SINGLE AND POLYCRYSTALLINE ALUMINUM AND COPPER, VOLUME 2 Ph.D. Thesis. Final Report
Paul H. Cohen May 1982 377 p
(Grant NsG-3164)
(NASA-CR-169528; NAS 1.26:169528; OSURF-760931/710709) Avail: NTIS HC A17/MF A01 CSCL 11F

Data are presented for aluminum and copper with 20, 30 and 50 deg tools. Data for computed mechanics on the shear plane and rake face are also included. S.L.

N83-13234# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MICROMECHANISMS OF CRACK EXTENSION IN ALLOYS Ph.D. Thesis
John A. Blind 1982 293 p refs
(AD-A119099; AFIT/CI-NR-82-25D) Avail: NTIS HC A13/MF A01 CSCL 11/6

This work describes an investigation of the effect of manganese-bearing dispersoid particles on the fracture characteristics of peak aged Al-Mg-Si alloys. Current elastic and elastic-plastic fracture toughness parameters are reviewed. The applicability of these parameters as criteria for the onset of crack extension and their variation with alloy microstructure are examined based on experimental results for a series of alloys containing differing volume fractions of disperoid. High purity alloys were used to isolate the effect of dispersoids from that of coarse constituent particles. Also, for comparison, one alloy of commercial purity containing both disperoids and coarse iron-bearing inclusions was studied. The ductile fracture toughness, Jlc, and the resistance to instability as measured by the tearing modulus, T, were found to increase with disperoid content. The values of these parameters were lower in the commercial purity alloy than for the equivalent high purity alloy. The effect of an increasingly triaxial state on fracture strain was measured using a series of notched tensile specimens. The alloy ductility was found to increase with disperoid content and to decrease with increased stress triaxiality. Crack tip plastic zone sizes on the midplane of compact tension specimens were measured using the SEM electron channelling pattern technique. Zone size was found to correlate with the square of the applied stress intensity factor. The constant of proportionality decreased with increasing disperoid content. The calculated work per unit area of new crack surface was found to correspond to the ductile fracture toughness measured for each alloy. GRA

N83-13235# Brown Univ., Providence, R. I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Annual Progress Report, 1981 - 1982
R. J. Asaro, J. Gurland, and A. Needleman Jul. 1982 35 p refs
(Contract DE-Ac02-80ER-10556)
(DE82-019950; DOE/ER-10556/91) Avail: NTIS HC A03/MF A01

The final results of the recently completed theoretical study of the stress and deformation fields near a growing crack are presented. The shear-lag model was successfully used to estimate stress in the hard martensite constituent of dual-phase steels under load. The stress values were correlated with the measured strain. In related work, the effect of the size and distribution of hard carbide particles on fracture initiation and fracture toughness was studied in high strength steels, 4140 and 4340, with particular attention to the mode of crack tip advance. The continuing study of the hydrogen assisted fracture of carbon steels was extended to a high carbon steel, i.e., 1095 spheroidized. This steel shows a transition of fracture mode from ductile to cleavage as a function of charging current density. In the area of elevated temperature rupture, a micromechanical model is proposed for creep crack growth by the mechanism of grain boundary void nucleation, growth, and coalescence with the macro-crack. DOE

N83-13236# Oak Ridge National Lab., Tenn.
WELD-METAL GRAIN STRUCTURE AND MECHANICAL PROPERTIES OF IRIDIUM ALLOY DOP-26
C. T. Liu and S. A. David Aug. 1982 33 p refs
(Contract W-7405-eng-26)
(DE82-019899; ORNL-5857) Avail: NTIS HC A03/MF A01

Weld metal grain structure and mechanical properties of the Ir-0.3% W alloy (DOP-26) doped with 60 ppM Th and 50 ppM Al have been investigated by use of a gas tungsten arc (GTA) welding process. The fusion zone grain structure is strongly influenced by heat input and puddle shape and therefore by the bead width. With increasing bead width from 2.5 to 3.7 mm, the grains in the fusion zone show a sharp change in growth direction near the centerline region and develop a fine columnar structure with grains growing parallel to the welding direction. Mechanical properties of the welds and base metal were characterized by tensile and impact tests from 650 to 11500C. The ductility and fracture behavior of DOP-26 welds are sensitive to weld bead width, postweld heat treatment, and weld-test orientation. DOE

N83-13237# Bendix Corp., Kansas City, Mo.
PRELIMINARY INVESTIGATION OF POWDER METAL MINIATURE PARTS
R. Owens Aug. 1982 30 p refs
(Contract DE-AC04-76DP-00613)
(DE82-019518; BDX-613-2815) Avail: NTIS HC A03/MF A01

Replacing miniature machined parts with powder metal parts can result in considerable cost savings by reducing or eliminating machining operations. However, the powder metal process has some distinct size, shape, and tolerance limitations. Experience with powder metal miniature precision parts defining and limitations are reviewed. DOE

N83-13238# Battelle Columbus Labs., Ohio.
INHIBITION OF STEAM-CONDENSATE CORROSION OF COPPER-BASED ALLOYS BY HYDRAZINE Final Report
J. A. Beavers, G. A. Breeze, and W. E. Berry Jul. 1982 24 p refs Sponsored by EPRI and Steam Generator Owners Group
(EPRI Proj. S195-1)
(DE82-905847; EPRI-NP-2492) Avail: NTIS HC A02/MF A01

An experimental evaluation was made of the potential inhibiting effect of hydrazine on the corrosion of CDA 687 (aluminum brass), and CDA 706 (90 copper - 10 nickel) in a simulated steam condensate containing ammonia under deaerated and partially aerated conditions. It was found that hydrazine inhibited the corrosion of CDA 687 under deaerated conditions, but increased corrosion rates somewhat under partially aerated (1 ppM oxygen) conditions. Corrosion rates of CDA 706 were more than an order of magnitude lower than CDA 687 and were not measurably influenced by hydrazine. DOE

N83-13239# Commissariat a l'Energie Atomique, Paris (France).
EMBRITTLEMENT OF THE ALLOY U 7.5 Nb 2.5 Zr BY GASEOUS OXYGEN
D. Lepoutre, A. M. Nomine, and D. Miannay Apr. 1981 12 p refs In FRENCH Presented at the 5th Intern. Conf. on Fracture, Cannes, France, 29 Mar. - 3 Apr. 1981
(DE81-700255; CEA-CONF-5678; CONF-810373-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Embrittlement of the alloy uranium 7.5 niobium 2.5 zirconium in gaseous oxygen and hydrogen versus stress intensity, temperature and pressure is studied using rupture mechanics. Cracking speed is determined. In oxygen, only cracks are produced and embrittlement is due to oxidation. In hydrogen at high pressure a hydride is formed and at low pressure cracks are produced, but the mechanism is not identified. DOE

N83-13240# Oak Ridge National Lab., Tenn.
STRESS-CORROSION STUDIES IN COAL-LIQUEFACTION ENVIRONMENTS
V. B. Baylor, J. R. Keiser, and J. H. DeVan 1981 10 p refs Presented at the 6th Ann. Conf. on Materials for Coal Conversion and Utilization, Gaithersburg, Md., 13 Oct. 1981
(Contract W-7404-eng-26)
(DE82-001464; CONF-811061-1) Avail: NTIS HC A02/MF A01

Over 300 U bend specimens from all four coal liquefaction pilot plants were examined by determining corrosion rates as well as by visual and metallographic analysis. Sulfur containing acids were studied. Results from U bend exposures in coal liquefaction pilot plants show that in the reactor and separator areas general corrosion and possibly some cracking of low alloy steels, sulfidation of nickel base alloys, cracking of some austenitic steels and generally good performance of stabilized austenitic, high alloy austenitic, duplex, ferritic austenitic, and ferritic stainless steels takes place. In the fractionation area extensive general corrosion and pitting of low alloy and stainless steels was found, with corrosion performance improving with higher nickel alloys (as with alloy 825). DOE

N83-13241# Sandia Labs., Albuquerque, N. Mex.
ANALYTIC AND EXPERIMENTAL DECAY HEAT DETERMINATIONS OF 800-MeV PROTON IRRADIATED ALUMINUM
L. N. Kmetyk and W. F. Sommer Oct. 1981 27 p refs
(Contract W-7405-eng-36)
(DE82-004187; LA-8956-MS) Avail: NTIS HC A03/MF A01

Postirradiation radiochemistry analysis of 800-MeV proton irradiated ultrahigh purity aluminum was done with standard gamma-ray counting equipment determining the Na-22 activity in the activated aluminum. Results are compared to predicted values obtained from CINDER, a general nuclide depletion and fission-product code. This program can be used easily to calculate the activity of materials under arbitrary irradiation, provided that the source terms for the various radionuclides produced are known. The required production cross sections were calculated by using the nucleon-meson transport code NMTC to determine the nuclear reactions produced by the protons, and the theory of Lindhard et al. to evaluate the resultant damage energy deposited in the target. DOE

N83-13242# Sandia Labs., Albuquerque, N. Mex.
DEFECTS AND AlSb PRECIPITATE NUCLEATION IN LASER-IRRADIATED ALUMINUM
P. S. Peercy, D. M. Follstaedt, S. T. Picraux, and W. R. Wampler 1981 6 p refs Presented at Ann. Meeting of the Materials Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003532; SAND-81-2526C; CONF-811122-28) Avail: NTIS HC A02/MF A01

Lattice defects and precipitates induced in unimplanted and Sb-implanted < 110 > single crystal Al by single pulse irradiation with a Q switched ruby laser were studied using ion beam analysis and electron microscopy. The absorbed laser energy during irradiation is directly measured in these studies to allow precise numerical modeling of the melt times and temperature profiles. For unimplanted Al, slip deformation gives rise to increased channeled yields throughout the analyzed depth and occurs for energies well below the melt threshold energy of 3.5 J/cu cm. Slip deformation is also observed for irradiation energies above the melt threshold energy, and melting is accompanied by a discontinuous increase in the minimum channeling yield. DOE

N83-13243# Sandia Labs., Albuquerque, N. Mex.
PULSED-ELECTRON-BEAM MELTING OF Fe
J. A. Knapp and D. M. Follstaedt 1981 11 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003582; SAND-81-1494C; CONF-81122-17) Avail: NTIS HC A02/MF A01

Pulsed (50 nsec) electron beams with deposited energies of 1.1 to 2.3 J/sq cm were used to rapidly melt a surface layer of Fe. Calculations show that this range of energies produces melt depths from 0.4 to 1.2 micrometers and melt times of 100 to 500 nsec. Optical microscopy and SEM of pulse treated polycrystalline foils show slip traces, as well as a general smoothing of surface features which shows that melting has occurred. TEM shows that the resolidified material is bcc, and that the material within a grain is epitaxial with the substrate. TEM also shows slip traces along (110) planes, as well as a high density of dislocations, both extended and loop. At the highest energy, subgrain boundaries are observed. DOE

N83-13244# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
QUANTITATIVE ANALYSIS OF CARBON IN IRRADIATED AUSTENITIC STEELS
Richard Cytermann and Michel Perrot Jun. 1981 7 p refs In FRENCH Presented at the Reunion du Groupement Microsonde de l'ANRT, Karlsruhe, West Germany, 23-24 Jun. 1981
(DE81-700636; CEA-Conf-5787; CONF-8106174-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Study of the carburization of austenitic steels under irradiation lead to the development of a measuring method of carbon concentration with a shielded microprobe MS46. This punctual analysis technique allows the determination of carbon distribution through the sample and offers more possibilities than classical methods: chemical analysis and microhardness. GRA

N83-13245# Sheffield Univ. (England). Dept. of Control Engineering.
SELF-TUNING MULTI-STEP PREDICTION APPLIED TO SPEED CONTROL OF A SINTER STRAND
P. P. Kanjilal and E. Rose May 1982 7 p refs Presented at Amer. Control Conf., Arlington, Va., Jun. 1982
(RR-185) Avail: NTIS HC A02/MF A01

A predictor for on-strand sinter processing which forecasts waste gas temperature several time steps ahead was developed. The on-strand process was modelled by a second order difference equation. An exponential forgetting factor was used to track slowly varying parameters. Waste gas temperature can be predicted to within 0.5 C, 6 min in advance, and 1.5 C 14 min in advance. If there is a brief stoppage on the strand, the algorithm retains the parameter values, and on restart, the prediction again becomes reliable after six sampling intervals (of 2 min). Author (ESA)

N83-13246# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Inst. fuer Chemie.
BEHAVIOR OF SOME MODIFIED ALUMINUM ALLOYS IN DYNAMIC AND NEARLY STATIC AIR SATURATED NORTH SEA WATER SYSTEMS
G. Venkateswaran (Bhabha Atomic Research Centre, Bombay) and E. Galow 1982 55 p refs
(GKSS-82/E/19; ISSN-0344-9629) Avail: NTIS HC A04/MF A01

The effect of sea water flow velocity on the corrosion behavior of aluminum alloys under aerated conditions at 315 K was studied. Four annealed and cold rolled alloys were tested in static and dynamic laboratory experiments. Results show that alloys containing Mg, or Mg in combination with Cr, corrode least. Pitting corrosion is the dominant form of corrosion. Results also show that corrosion performance can be improved by controlling disolved oxygen levels in the water. Static corrosion rates are much lower than dynamic rates. Author (ESA)

N83-13247# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
EFFECT OF THROAT THICKNESS, PLATE THICKNESS AND WELDING PROCEDURE ON THE FATIGUE STRENGTH OF HIGH STRENGTH STEELS In GERMAN; ENGLISH summary
M. Greif and R. Olivier 1982 111 p refs Sponsored by VDEh-Gesellschaft
(Contract AIF-4114)
(LBF-FB-163/82; ISSN-0721-5320) Avail: NTIS

HC A06/MF A01

The effect of throat and plate thickness, welding procedure and post weld heat treatment on the fatigue strength of angular fillet welds in six structural and high strength steels is investigated. The statistically designed factorial includes constant amplitude tests under alternating or zero to tension loading on manual or submerged arc welded specimens in 50 and 20 mm thick plate. At an identical ratio of throat thickness to plate thickness, the fatigue strength of 20 mm thick specimens is about a factor of 1.3/1 higher than that of 50 mm thick specimens. This increase is verified by spot strain measurements at the fatigue critical weld toe. Plate material and welding procedure are parameters of minor importance. Stress relief leads to an increase of fatigue strength, depending on plate thickness and stress ratio. The supportable stress amplitude is higher under alternating than under zero to tension loading. Author (ESA)

N83-13248# Societe Anonyme Belge de Constructions Aeronautiques, Brussels (Belgium).

AGING OF SMALL CRYOGENIC HEAT PIPES Final Report

Paris ESA 31 Mar. 1982 85 p refs

(SABCA-JPM/LN/H05/N28; ESA-CR(P)-1631) Avail: NTIS HC A05/MF A01

Stainless steel heat pipes with a diameter of 3mm and 6mm, charged with nitrogen, methane and ethane were placed in a chamber cooled with liquid nitrogen and operated during one year at a temperature within the working range of each heat carrier. Temperature distributions were monitored continuously and power performance was checked quarterly. A full performance test carried out after one year aging does not reveal significant degradations. Author (ESA)

N83-13249# Rolls-Royce Ltd., Derby (England).

CONTRIBUTION TO THE STUDY OF NITROGEN BEHAVIOR IN THE RECYCLING OF PRECISION CASTING NICKEL-BASE SUPERALLOYS Annual Report, Dec. 1981

S. Rupp, M. Postlethwaite, J. Massol, and G. Lesoult Dec. 1982 15 p refs Transl. into ENGLISH of Ecole des Mines (Paris) Rept., Dec. 1981 Prepared in cooperation with Ecole des Mines

(PNR-90121; Trans-16164; TLT-00876) Avail: NTIS HC A02/MF A01

Recycled and virgin IN 100 was studied by differential thermal analysis. Samples quenched during directional solidification were also analyzed. Differences between the liquidus temperatures of virgin and recycled alloys are due more to the variation in chemical composition than to the effect of recycling. Differences in carbide morphology are not always a means of establishing a clear contrast between virgin alloy and recycled alloy, judging from the observations made on metal quenched during directional solidification. Differences in microporosity observed in the laboratory and in foundry practice could be the result of chemical phenomena (evolution of gases) rather than the outcome of differences in the solidification process. Author (ESA)

N83-13250# Rolls-Royce Ltd., Derby (England).

EFFECT OF CREEP AND AGING PHENOMENA UNDER STRESS ON THE LOW CYCLE FATIGUE STRENGTH OF TITANIUM ALLOY 685 BETWEEN 25 AND 400 C

B. Deslandes, A. Reyes, C. Quesne, and P. Lacombe Mar. 1982 16 p refs Transl. into ENGLISH of paper presented at the Conf. on the Study of Titanium and its Alloys (France), 1978 Conf. held in Nantes, France, 28-29 Nov. 1978

(PNR-90122; Trans-15963; TLT-00850) Avail: NTIS HC A02/MF A01

The low cycle fatigue tests on TA6Zr5D and Ti 685 were carried out at temperatures between 25 and 400 C with different cycle profiles. Creep and aging tests under stress were also carried out in the same temperature range. Tests show that creep or relaxation phenomena can occur at temperatures below 100 C if fatigue cycles are superimposed on soak times under load. Above 125 C, the effects due to strain aging begin to be felt; during high soak times, the creep and relaxation phenomena become negligible, whereas the beneficial phenomena of over consolidation occur. Around 300 C, the aging process is very rapid; the influence of soak times under load then become minimal, the frequency of the cycles being, in all cases, low enough to induce hardening. Author (ESA)

N83-13251# Rolls-Royce Ltd., Derby (England).

HIGH-SPEED SOLIDIFICATION OF COLUMNAR GRAIN AND SINGLE CRYSTAL BLADES

Y. Nakagawa, K. Murakami, A. Othomo, M. Fukagawa, and Y. Saiga Mar. 1982 20 p refs Transl. into ENGLISH from Ishikawa-Jima Harima Giho (Japan), v. 47, no. 5, 1977 p 467-471

(PNR-90123; Trans-16113; TLT-00872) Avail: NTIS HC A02/MF A01

On-line solidification control manufacture of columnar grain and single crystal Rene 80 blades is described, and creep tests on columnar crystal round rod elements are discussed. A mean temperature gradient giving a withdrawal velocity of 30 cm/hr in high speed solidification furnaces is suitable for industrial application. The temperature gradient varies, however, with the shape of the mold and with the withdrawal velocity. Results with on-line control based on mold wall temperature measurements indicate that this method is highly effective when the value of the temperature gradient/solidification rate ratio lies within a given range. Comparison of the creep strain behavior of material obtained by unidirectional solidification with that of conventionally cast material shows that the third stage creep is extended at high temperatures and the second stage creep at lower temperatures. Author (ESA)

N83-13252# Rolls-Royce Ltd., Derby (England).

MEASUREMENT OF RESIDUAL STRESS IN ROUND BARS QUENCHED AFTER HEATING BY INDUCTION

A. Chabenat and J. F. Flavenot Nov. 1981 19 p refs Transl. into ENGLISH from Revue de Metal. (France), v. 124-78 p 61-67

(PNR-90134; Trans-16004; TLT-00855) Avail: NTIS HC A02/MF A01

Spatial stress distributions (compressive stresses in the outside layers and tensile stresses in the core) in round steel bars quenched after induction heating were determined in order to examine the effect of surface treatment. Three hardness profiles were created by quenching with different water temperatures and induction power. As the depth of treatment increases, residual stresses increase steadily, the stressed zone is larger than the transformed zone and very soon extends throughout the part. With large depths of treatment, tensile stresses in the central zone are high and can cause plastic flow in this area during quenching. Very slight variations in the treatment conditions result in appreciable differences in residual stress distribution and values. Author (ESA)

N83-13253# Rolls-Royce Ltd., Derby (England).

EFFECT OF THE SIGMA-PHASE ON THE MECHANICAL PROPERTIES OF A Ni-Cr-Co BASED SUPERALLOY

G. S. Chen, C. C. Yao, and Z. Y. Zhong May 1982 16 p refs Transl. into ENGLISH from Acta Metal. Sinica (China), v. 14, no. 3, 1978 p 284-291

(PNR-90141; Trans-16126; TLT-16126) Avail: NTIS HC A02/MF A01

The effects of different contents of sigma phase on the tensile strength, impact strength, fatigue resistance, and fracture toughness of a NiCrCo superalloy were tested. Results show that the precipitation of small amounts of sigma phase during long-term aging does not exert any significant effect on mechanical properties. When larger amounts of sigma phase are precipitated, there is a marked lowering of the tensile strength, impact strength, rupture life and creep and fracture resistance of the alloy. This is accompanied by the development of cracks along the interfaces with the sigma phase. There is no effect on tensile strength at high temperatures. The sigma phase is hard and brittle at room temperature, but at elevated temperatures it displays a certain degree of plasticity and can then undergo deformation comparatively readily. Author (ESA)

N83-13254# SEACO, Inc., Alexandria, Va.
AN INVESTIGATION OF THE EFFECTS OF CAVITATING WATER JETS ON THE SURFACE PREPARATION OF STRUCTURAL STEEL PRIOR TO REPAINTING Final Report, Oct. 1980 - Oct. 1981
S. A. Nicinski, R. A. May, and M. S. Rice Jan. 1982 108 p refs (Contract DTFH61-80-C-00174)
(PB82-229121; Rept-81-RE09-01WA; FHWA/RD-82/002) Avail: NTIS HC A06/MF A01 CSCL 13I

Environmental constraints on the emission of particulate matter into the air during abrasive blast cleaning of steel structures is discussed to the use of cavitating water jets to propare surfaces prior to repainting was investigated. Several cavitating water jet nozzles were tested to determine their area cleaning rate, effectiveness and thrust index in the removal of paint systems from test panels to an acceptable cleaned surface. This program included the design and fabrication of four handheld tools that utilizes optimum cavitating nozzles. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-13255 Princeton Univ., N. J.
THE CURE OF THERMOSETTING EPOXY/AMINE SYSTEMS Ph.D. Thesis
John Benjamin Enns 1982 402 p refs
Avail: Univ. Microfilms Order No. DA8221568

The cure of thermosetting epoxy/amine resins was studied on a macroscopic level by dynamic mechanical spectrometry, moisture absorptivity, density and thermogravimetry, and on a molecular level by infrared spectroscopy and gel fraction experiments. Increasing the extent of cure was found to lower the room temperature modulus and density, and raise the moisture absorptivity and glass transition of the resin. The influence of chemical structure on the kinetics and physical properties was investigated by comparing diepoxides of varying molecular weights cured with aliphatic and aromatic tetrafunctional amines. The observation of systematic changes in the time of vitrification led to the development of a time temperature-transformation cure diagram for thermosetting systems. Dissert. Abstr.

N83-13256 Defence Research Information Centre, Orpington (England).
EXPANDED PLASTIC MATERIALS: A REVIEW
Jul. 1982 26 p refs Transl. into ENGLISH from Kunststoffberater (West Germany, v. 23, no. 10, 1978 p 546-552
(DRIC-T-6685; BR84269) Copyright. Avail: Issuing Activity

The electrical, chemical, heat resistance, and weathering properties, production methods, and uses of expanded plastics are summarized. Epoxy resin expanded plastics, polyvinyl chloride foams, phenolic resin foams, polyethylene foams, polyurethane foams, polypropylene foams, urea-resin foams, silicone resin foams, and expanded polystyrene materials are covered. Author (ESA)

N83-13257*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POLYIMIDES: TRIBOLOGICAL PROPERTIES AND THEIR USE AS LUBRICANTS
Robert L. Fusaro 1982 31 p refs Presented at the 1st Tech. Conf. on Polyimides, Ellenville, N.Y., 10-12 Nov. 1982; sponsored by the Society of Plastics Engineers, Inc.
(NASA-TM-82959; E-1376; NAS 1.15:82959) Avail: NTIS HC A03/MF A01 CSCL 11I

Friction, wear, and wear mechanisms of several different polyimide films, solid bodies, composites, and bonded solid lubricant films are compared and discussed. In addition, the effect of such parameters as temperatures, type of atmosphere, contact stress, and specimen configuration are investigated. A friction and wear transition occurs in some polyimides at elevated temperatures and this transition is related to molecular relaxations that occur in polyimides. Friction and wear data from an accelerated test (pin-on-disk) are compared to similar data from an end use test device (plain spherical bearing), and to other polymers investigated in a similar geometry. Author

N83-13258*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL APPROACH FOR CONTROLLING NADAMIDE CURE TEMPERATURE AND RATE Patent Application
Richard W. Lauver, inventor (to NASA) Filed 3 Aug. 1982 22 p (NASA-Case-LEW-13770-1; US-Patent-Appl-SN-404809) Avail: NTIS HC A02/MF A01 CSCL 11I

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 C by controlling the available concentration of the maleic-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant. Author

N83-13259*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SOLVENT RESISTANT, THERMOPLASTIC AROMATIC POLY (IMIDESULFONE) AND PROCESS FOR PREPARING SAME Patent Application
David A. Yamaki and Terry L. St.Clair, inventors (to NASA) Filed 11 Aug. 1982 13 p
(NASA-Case-LAR-12858-1; US-Patent-Appl-SN-407240) Avail: NTIS HC A02/MF A01 CSCL 11I

A process for preparing a thermoplastic poly(imidesulfone) is disclosed. This resulting material has thermoplastic properties which are generally associated with polysulfones but not polyimides, and solvent resistance which is generally associated with polyimides but not polysulfones. This system is processable in the 250 to 350 C range for molding, adhesive, and laminating applications. This unique thermoplastic poly(imidesulfone) is obtained by incorporating an aromatic sulfone moiety into the backbone of an aromatic linear polyimide by dissolving a quantity of a 3,3',4,4'-benzophenonetetracarboxylic dianhydride (BTDA) in a solution of 3,3'-diaminodiphenylsulfone and bis(2-methoxyethyl)ether, precipitating the reactant product in water, filtering and drying the recovered poly(amide-acid sulfone), and converting it to the poly(imidesulfone) by heating. NASA

N83-13260# DeLeuw, Cather-Parsons and Associates, Washington, D.C.
NORTHEAST CORRIDOR IMPROVEMENT PROJECT TASK 211: B AND P TUNNEL POLYMER CONCRETE FIELD TRIALS, BALTIMORE, MARYLAND Final Report
Feb. 1982 376 p refs Prepared in cooperation with Silikal North American, Inc.
(Contract DOT-FR-76048)
(PB82-237900; FRA-RNC-82-1) Avail: NTIS HC A17/MF A01 CSCL 13C

Activities, test results, construction techniques, and other pertinent data and information developed related to the Baltimore & Potomac (B&P) Tunnel polymer concrete field trials are reported. The field trials were conducted for two purposes: (1) development of the equipment, construction techniques, and experience necessary to effectively design, plan, and estimate costs for the B&P Tunnel invert rehabilitation, (2) to obtain sufficient information about polymer material determine those characteristics required for rehabilitation of the tunnel invert. GRA

N83-13261# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Sciences.
COMPRESSIVE STRENGTH, HARDNESS, AND IDENTIFICATION

DAMAGE IN CERAMIC MATERIALS Interim Technical Report, 1 Oct. 1981 - 31 Jul. 1982
James Lankford, Jr. Jul. 1982 54 p refs Submitted for publication
(Contract N00014-75-C-0668; NR Proj. 032-553; SRI Proj. 4231)
(AD-A119141) Avail: NTIS HC A04/MF A01 CSCL 11/4

Hardness and compressive strength of several strong ceramics are measured from room temperature to 1000 C. Similarities in behavior, and the results of microscopic examination, are interpreted in terms of the relative contributions of microplasticity and microfracture to material failure during compression testing and microhardness indentation. It is shown that microplasticity alone is an insufficient basis upon which to relate material response under the two test conditions, and that tensile microfracture is a significant contributor both to compressive failure and to subsurface indentation deformation, hence to hardness. Previous determinations of the strengths of several ceramics subject to impulsive loads were interpreted in terms of a theory based on material inertia. Recent experiments are described, which show that the dynamic strengthening mechanism is athermal, as required by the inertial theory, and that microcrack growth, rather than initiation, is suppressed by the inertial effect. Indentation microfracture measurements in the low load, near threshold regime were carried out using scanning electron microscopy. Results were interpreted in terms of existing theoretical treatments. GRA

N83-13262# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
STRESS RELATED SURFACE TENSION EFFECTS IN HARD ELASTIC POLYMERS Interim Technical Report
Kim Walton, Adelsamie Moet, and Eric Baer 19 Aug. 1982 41 p refs
(Contract N00014-75-C-0795)
(AD-A119075; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/9

Stress depressions of hard elastic polypropylene, hard elastic high impact polystyrene, and Gore-Tex, A nonelastic, porous, Teflon material were measured when these polymers, under load, were subjected to changes in their environment from air to various nonswelling liquids. The stress depressions were studied as a function of liquid surface tension and viscosity and the strain imposed on the materials. Results indicate that these microfibrillated polymers contain a substantial surface energy component in their stress which is independent of strain at high tension. This surface energy component is apparently inversely proportional to the average microfibril diameter. It suggested that a maximum fibril diameter limiter exists such that, above this limit, hard elastic behavior will not occur. Author (GRA)

N83-13263# Defence Research Establishment, Ottawa. (Ontario).
THE EFFECT OF LOW TEMPERATURES ON COATED AND UNCOATED FABRICS
Rita M. Crow and Malcolm M. Dewar Mar. 1982 73 p refs
(AD-A119008; DREO-R-858) Avail: NTIS HC A04/MF A01 CSCL 11/5

The effect of low temperatures on the shape of the load-elongation curve, the initial modulus, breaking load, percent elongation and work to rupture of 13 coated and uncoated fabrics was examined. It was found that the cotton/synthetic blends were least sensitive to low temperatures, the nylon fabrics, be they coated with polyurethane or neoprene, or uncoated, were more sensitive. The PVC-coated nylon scrims were the most sensitive and, for all practical purposes, completely inappropriate for use at temperatures below 0 deg C. Author (GRA)

N83-13264# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
HYDRAULIC SYSTEM WEAR DEBRIS ANALYSIS Final Report, Sep. 1980 - Sep. 1981
D. H. Ahlberg Lakehurst, N.J. Naval Air Engineering Center 3 Aug. 1982 134 p
(Contract N68335-80-C-0532; WF41461000)
(AD-A119364; NAEC-92-162) Avail: NTIS HC A07/MF A01 CSCL 11/10

The use of Ferrography as a means to detect elastomer wear in aircraft hydraulic systems is explored. A method is described which increases the deposition of elastomer material on the Ferrogram. Nine distinct seal wear mechanisms are identified. Metallic wear debris from different sample points is compared. Author (GRA)

N83-13265# General Electric Co., Schenectady, N. Y.
CERAMIC MATERIALS FOR FUSION REACTORS Final Report
G. C. Trantina and J. Corelli (Rensselaer Polytechnic Inst.) Jul. 1982 85 p refs
(EPRI Proj. 992)
(DE82-905812; EPRI-AP-2515) Avail: NTIS HC A05/MF A01

Siliconized silicon carbide was identified as the most promising low-activity ceramic for use in fusion first walls and blankets. Further design and materials studies indicated that a cylindrical ceramic module attached to a low-activity aluminum backing plate can be designed with a very low probability of failure at a wall loading of 1 MW/m(2), assuming no degradation of the mechaical and physical proprties of the ceramic. To achieve the low probability of failure, strengthening and proof testing of the ceramic by a heat treatment at 12000 C are necessary. Irradiation testing of silicon carbide concentrated on B(1)0 doped specimens to study the effect of helium production during irradiation. Previous indications of a rapid decline in strength of boron-doped sintered alpha silicon carbide were confirmed. The strength of siliconized silicon carbide also decreases with increasing helium generation, but at a relatively slow rate. A strength decline of 24% was noted after irradiation to a fluence of 7.6 x 10(24) n/m(2), during which 1280 AppM helium was produced. DOE

N83-13266# Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen am Rhein (West Germany). Kunststofflab.
SYNTHESIS OF ELECTRICALLY CONDUCTING POLYMERS [SYNTHESE ELEKTRISCH LEITFAEHIGER POLYMERER]
Herbert Naarmann 1982 44 p refs In GERMAN Presented at Conf. on Syn. Polymere mit aussergewoehnlichen Eigenschaften, Bad Nauheim, West Germany, 19-20 Apr. 1982
Avail: NTIS HC A03/MF A01

The most important publications with the exception of the patents in the intensively researched field of the synthesis of aliphatic and aromatic polymers with pi electron conjugation as well as their doping to highly conducting materials are presented. For the synthesis of electrically conducting polymer backbones, an abundance of synthetic routes is available. In addition to the conventional stepwise synthesis, using the Wittig, Horner or Grignard reactions, polycondensation processes and metal-catalysed polymerization techniques can be employed. Oxidative coupling with oxidizing Lewis acid catalysts generally leads to polymers with aromatic or heterocyclic units. The Ziegler-Natta polymerization of acetylenes to film building polyacetylenes found broad acceptance; it represents, however, only one of the many possible reactions, in which reducing agents in combination with transition metals are catalytically active. The polymers synthesized via this process are made electrically conducting by doping. On the other hand, the direct polymerization process, e.g., starting from acetylene or aromatics, using the doping agent or via anodic oxidation, e.g., from pyrrole, leads direct to materials with a high electrical conductivity. Author (ESA)

N83-13267# Bureau of Mines, University, Ala.
CHEMICALLY BONDED REFRACTORIES: A REVIEW OF THE STATE OF THE ART
Rustu S. Kalyoncu May 1982 26 p refs
(PB82-232505; BM-IC-8878; LC-81-607575) Avail: NTIS HC A03/MF A01 CSCL 11B

The state of the art of chemically bonded refractories was surveyed in the scientific literature, government reports, and patents. A review of research and development results for phosphate, silicate, oxychloride, oxysulfate, and other bonding agents used in refractories manufacture revealed that references on bonding mechanisms, bond formation kinetics, and other important process parameters and conditions were few and

universally vague. As a result, recommendations are made to expand research efforts to investigate the kinetics and mechanisms of reactions in chemically bonded refractories. GRA

N83-13268# Bureau of Mines, Tuscaloosa, Ala. Research Center.
CORROSION RESISTANCE OF CERAMIC MATERIALS TO HYDROCHLORIC ACID (20 WEIGHT-PERCENT AT 50 DEG C)
James P. Bennett May 1982 17 p refs
(PB82-233750; BM-RI-8650; LC-81-607167) Avail: NTIS HC A02/MF A01 CSCL 11B

Eight commercial ceramic materials comprising two red shale, two fire clay, a silica, a silicon carbide, a carbon, and a high alumina brick were evaluated for their corrosion resistance. Samples were exposed to 20 wt pct HCl at 50C for 110 days. The test apparatus designed to evaluate the materials is described. Changes in chemical and mineralogical composition, cold crushing strength, volume, and weight, and leach rates of Al, Ca, Fe, K, Mg, Na, Si, and Ti ions were monitored. In general, the statistically significant physical property changes that occurred were small. In many cases, no changes were detected. Author (GRA)

N83-13269# National Bureau of Standards, Washington, D.C. Center for Materials Science.
EFFECTS OF CRACK GROWTH ON THE LOAD-DISPLACEMENT CHARACTERISTICS OF PRECRACKED SPECIMENS UNDER BENDING
T. J. Chuang, E. R. Fuller, Jr., R. J. Fields, and L. Chuck May 1982 41 p refs
(Contract DE-A105-800R-20679)
(PB82-237678; NBSIR-82-2504) Avail: NTIS HC A03/MF A01 CSCL 11B

A critical evaluation of the feasibility of obtaining crack growth parameters from end tests is presented. First derived are the governing differential equations which characterize the time-history of bend test parameters for a given elastic material exhibiting power law crack growth behavior. A numerical solution scheme is then developed which is capable of solving the initial value problem, thus quantitatively assessing the influence of crack growth on the load-displacement output. The results of this analysis indicate that for high N materials (where N is the exponent in the power law crack growth equation) the flexural test method gives a broad error band in N prediction and hence is not a reliable technique. However, it can be used by a designer to quickly screen the new materials with high N values. Author (GRA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-13270# Office of Technology Assessment, Washington, D.C.
INCREASED AUTOMOBILE FUEL EFFICIENCY AND SYNTHETIC FUELS. ALTERNATIVES FOR REDUCING OIL IMPORTS Summary Report
Sep. 1982 39 p refs
(OTA-E-186) Avail: NTIS HC A03/MF A01; HC also available from SOD

Increased automobile fuel efficiency and synthetic fuels production with respect to their potential to reduce conventional oil consumption, and their costs and impacts are assessed. Conservation and fuel switching as a means of reducing stationary oil uses are also considered. S.L.

N83-13271# Materials Research Labs., Melbourne (Australia).
THE 2-PICRYL-5-NITROTETRAZOLE: SYNTHESIS AND EXPLOSIVE PROPERTIES
Robert J. Spear and Paul P. Elischer Jul. 1982 21 p refs
(MRL-R-859; AR-003-042) Avail: NTIS HC A02/MF A01

PNT (2-Picryl-5-nitrotetrazole) was synthesized by reaction of anhydrous sodium 5-nitrotetrazole with picryl chloride and obtained in suitable physical form by crystallization from acetone hexane. Impact, thermal and electrostatic sensitivity are all typical of a primary explosive PNT ignites from match head or hot wire to a powerful explosion but does not detonate unless initiated by a strong shock such as from detonating lead azide. RDX can be detonated by 100 mg of PNT but heavy confinement is required. PNT shows excellent promise as a replacement for tetrazene as an energetic sensitizer in stab (and percussion) sensitive mixtures. Author

N83-13272*# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
FUMIGATION OF ALCOHOL IN A LIGHT DUTY AUTOMOTIVE DIESEL ENGINE Final Report
Entezaam M. H. Broukhiyan and Samuel S. Lestz Aug. 1981 121 p refs
(Grant NAG3-91; Contract DE-AI01-81CS-50006)
(NASA-CR-167915; DOE/NASA/0091-1; NAS 1.26:167915; CAES-600-81) Avail: NTIS HC A06/MF A01 CSCL 21D

A light-duty automotive Diesel engine was fumigated with methanol in amounts up to 35% and 50% of the total fuel energy respectively in order to determine the effect of alcohol fumigation on engine performance at various operating conditons. Engine fuel efficiency, emissions, smoke, and the occurrence of severe knock were the parameters used to evaluate performance. Raw exhaust particulate and its soluble organic extract were screened for biological activity using the Ames Salmonella typhimurium assay. Results are given for a test matrix made up of twelve steady-state operating conditions. For all conditions except the 1/4 rack (light load) condition, modest thermal efficiency gains were noted upon ethanol fumigation. Methanol showed the same increase at 3/4 and full rack (high load) conditions. However, engine roughness or the occurrence of severe knock limited the maximum amount of alcohol that could be fumigated. Brake specific nitrogen oxide concentrations were found to decrease for all ethanol conditions tested. Oxides of nitrogen emissions, on a volume basis, decreased for all alcohol conditions tested. Based on the limited particulate data analyzed, it appears that ethanol fumigation, like methanol fumigation, while lowering the mass of particulated emitted, does enhance the biological activity of that particulate. Author

N83-13273*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VACUUM SPUTTERED AND ION-PLATED COATINGS FOR WEAR AND CORROSION PROTECTION
T. Spalvins 1982 17 p refs Presented at the 1982 Ann. Meeting of the Am. Inst. of Chem. Eng., Los Angeles, 14-19 Nov. 1982
(NASA-TM-83007; E-1411; NAS 1.15:83007) Avail: NTIS HC A02/MF A01 CSCL 21D

The plasma or ion-assisted coating techniques such as sputtering and ion plating are discussed in view of wear and corrosion protection. The basic processes and the unique features of the technique are discussed in regard to the synthesis and development of high reliability wear and corrosion resistant films. The ions of the plasma which transfer energy, momentum, and charge to the substrate and the growing films can be beneficially used. As a result, coating adherence and cohesion is improved. Favorable morphological growth such as high density and porosity-free films can be developed, and residual stresses can be reduced. Author

N83-13274# LSI Technologies, Inc., Westmont, N.J.
AN INVESTIGATION OF SECONDARY JETTING PHENOMENA HYPERJET SHAPED CHARGE Final Report, Mar. 1980 - Nov. 1981
J. Kowalick and T. E. DePhillipo Aug. 1982 88 p
(Contract DAAK10-80-C-0078)
(AD-A118908; LSIR-0078) Avail: NTIS HC A05/MF A01 CSCL 19/1

Secondary jetting phenomena, the formation of high velocity

jets from the collision of several primary (normally formed) shaped charge jets, was experimentally demonstrated during this program. A one dimensional computer simulation code 'HYJETS' was also developed to evaluate various design concepts by simulating jet formation performance. Author (GRA)

N83-13275# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.

MODELING OF DEFLAGRATION-TO-SHOCK-TO-DETONATION TRANSITION (DSDT) IN POROUS HIGH ENERGY SOLID PROPELLANTS AND EXPLOSIVES Annual Report, 1 Jun. 1981 - 30 May 1982

Herman W. Krier, P. Barry Bulter, and Daniel Coyne Jul. 1982 30 p refs

(Grant AF-AFOSR-0145-82; AF Proj. 2301)

(AD-A119262; UILU-ENG-82-4002; AFOSR-82-0686TR) Avail: NTIS HC A03/MF A01 CSCL 19/1

This annual report represents the summary of work done on the modeling of processes leading from deflagration to detonation in porous or granular high energy propellants. Particular attention is paid to the analysis of shock development from compression waves forming ahead of confined burning in the original material. It is summarized that if the shock is sufficiently strong, it will lead to shock to detonation transition (SDT). During the development of the shock wave, the porous material may collapse into a solid plug of void free propellant because the speed at which the wave propagates increases as the material is compressed. The modeling effort presented indicates how two-phase unsteady combustion processes in granular material can couple to the solid mechanics of shock formation and eventually to a steady-state detonation. Author (GRA)

N83-13276# Department of Energy, Washington, D. C. Office of the Assistant Secretary for Conservation and Renewable Energy.

SUMMARY OF DOE HYDROGEN PROGRAM FY-1981 BY THE HYDROGEN ENERGY COORDINATING COMMITTEE

Jul. 1982 52 p

(DE82-020494; DOE/CE-034) Avail: NTIS HC A04/MF A01

Hydrogen, as an energy storage medium and as a general purpose fuel is emphasized. The production storage, and use of hydrogen as a mobile fuel, as a stationary fuel, as a fuel feedstock, or as a chemical feedstock is studied, individual elements of the hydrogen program are described. DOE

N83-13277# Wisconsin Univ., Madison.

ALCOHOL AS A FUEL FOR FARM AND CONSTRUCTION EQUIPMENT

G. L. Borman, D. E. Foster, P. S. Meyers, O. A. Uyehara, J. Chen, X. Gao, and Z. Ye Jun. 1982 33 p refs

(Contract DE-AC02-79CS-50025)

(DE82-021022; DOE/CS-50025/2) Avail: NTIS HC A03/MF A01

Work in three areas dealing with the utilization of ethanol as fuel for farm and construction diesels is summarized. What is known about the retrofitting of diesels for use of ethanol and the combustion problems involved is reviewed. The performance of a single cylinder, open chamber diesel using solutions and emulsions of diesel fuel with ethanol is described. Data taken include performance, emissions and cylinder pressure-time for diesel fuel with zero to forty percent ethanol by volume. Analysis of the data includes calculation of heat release rates using a single zone model. An investigation into retrofitting a multicylinder turbocharged farm tractor diesel to use ethanol by fumigation is discussed. Three methods of ethanol introduction are discussed; spraying ethanol upstream and downstream of the compressor and prevaporization of the ethanol. Data on performance and emissions are given for the last two methods. A three zone heat release model is described and results from the model are given. A correlation of the ignition delay using prevaporized ethanol fumigation data is also given. Comparisons are made between fumigation in DI and IDI engines. DOE

N83-13278# Lyon Univ. (France). Institute de Physique Nucleaire.

CONTRIBUTION TO THE ANALYSIS OF HYDROGENATED AMORPHOUS SILICON BY NUCLEAR METHODS Ph.D. Thesis

Luc Jeannerot 1981 62 p refs In FRENCH

(DE81-700251; LYCEN-8076) (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The physico chemical characterization of hydrogenated amorphous silicon thin films (0,5 to 2 micrometers thick) makes use of nuclear microanalysis for quantitative determination and depth profiling of the elements hydrogen, oxygen, and argon and carbon. Concerning the methods, performances of the hydrogen analysis using the nuclear reaction are presented emphasizing the precision and the analytical consequences of the interaction ion-material. For charged particles data processing (mainly Rutherford backscattering) computer treatments were developed either for concentration profile obtention as for spectra prediction of given material configurations. The essential results concerning hydrogenated silicon prepared by RF sputtering are on one hand the correlation between the oxygen incorporation and the beam-induced hydrogen effusion and in the other hand the role of the substrate in the impurities incorporation. From the study of the elaboration conditions of the material a tenative interpretation is made for the incorporation and the role of oxygen. DOE

N83-13279# TRW, Inc., Redondo Beach, Calif. Environmental Div.

A COMPENDIUM OF SYNFUEL END USE TESTING PROGRAMS Final Report, Mar. - Sep. 1981

M. Ghassemi, S. Quinlivan, and M. Haro May 1982 237 p refs

(Contract EPA-68-02-3174)

(PB82-236936; EPA-600/7-82-035) Avail: NTIS HC A11/MF A01 CSCL 07A

Information on major, recently completed, current, and planned synfuel end-use testing projects is given. It is intended to promote the flow of information between synfuel testing programs, thereby reducing the duplication of effort and enabling design and implementation of cost-effective and systematic approaches to the collection of appropriate environmental data in conjunction with on-going and planned performance testing projects. Projects described in the compendium include testing of shale-derived fuels, middle distillates, coal liquids, and methanol/indolene mixtures in such equipment as utility boilers, steam generators, diesel engines (laboratory and full scale), auto engines, and other combustors. GRA

N83-13280# Radian Corp., McLean, Va.

SOURCE TEST AND EVALUATION REPORT: ALCOHOL FACILITY FOR GASOHOL PRODUCTION Final Report, Oct. 1979 - Feb. 1980

R. M. Scarberry, M. P. Papai, Paul E. Mills, and Thomas J. Powers, III Apr. 1982 199 p refs

(Contract EPA-68-02-2667)

(PB82-237041; EPA-600/7-82-018) Avail: NTIS HC A09/MF A01 CSCL 07A

The requirements for environmental sampling and analysis of alcohol-producing facilities capable of supporting a gasohol industry are defined and these requirements are applied to the environmental characterization of an alcohol plant. A conceptual design of a grain alcohol plant using a coal-fired boiler that is projected to be typical of future plants which will support a Gasohol industry is given. Environmental control options are also discussed based on a comparison of alcohol plant stream compositions with environmental regulations. The results of this study provide preliminary information on the environmental consequences of large-scale fermentation ethanol plants which will provide alcohol for gasohol. GRA

N83-13281# Southwest Research Inst., San Antonio, Tex.

CHARACTERIZATION OF DIESEL EMISSIONS FROM OPERATION OF A LIGHT-DUTY DIESEL VEHICLE ON ALTERNATE SOURCE DIESEL FUELS

Bruce B. Bykowski Nov. 1981 74 p refs

(Contract EPA-68-03-2884)
(PB82-232448; EPA-460/3-82-002) Avail: NTIS HC A04/MF A01 CSCL 21D

Emission evaluations of several alternate-source fuels in a 1980 Volkswagen Rabbit Diesel are described. Fuels tested included a no. 2 petroleum diesel as base, base plus coal derived liquids, shale oil diesel fuel and jet fuel, and a blend of petroleum blend stocks with coal and shale liquids. Nine fuels were investigated including the base fuel. GRA

N83-13282# Southwest Research Inst., San Antonio, Tex.
CHARACTERIZATION OF DIESEL EMISSIONS FROM OPERATION OF A LIGHT-DUTY DIESEL VEHICLE ON ALTERNATE SOURCE DIESEL FUELS Final Report, Jun. 1980 - Oct. 1981
Bruce B. Bykowski Nov. 1981 190 p refs
(Contract EPA-68-03-2884)
(PB82-234147; EPA-460/3-82-002) Avail: NTIS HC A09/MF A01 CSCL 21D

Alternate source diesel test fuels and their effects on regulated and unregulated exhaust emissions from a 1980 Volkswagen Rabbit were examined. Nine fuel blends were tested: a no. 2 petroleum diesel as base, base plus coal derived liquids, shale oil diesel and jet fuel, and other blends of coal derived liquids, shale oil liquids, and petroleum stocks. Analyses performed include gaseous hydrocarbons, CO, NOx, particulate mass, phenols, smoke, odor, Ames tests, BaP, and polarity by HPLC. Smoke and particulate increases are generally associated with use of coal derived liquids. GRA

N83-13283# Gulf South Research Inst., New Orleans, La.
COMPONENTS IDENTIFIED IN ENERGY-RELATED WASTES AND EFFLUENTS Final Report, Nov. 1976 - Nov. 1979
J. E. Gebhart and M. M. McKown May 1982 734 p refs
(Contract EPA-68-03-2487)
(PB82-236985; EPA-600/3-82-058) Avail: NTIS HC A99/MF A01 CSCL 21D

A state-of-the-art review of the characterization of solid wastes and aqueous effluents generated by energy-related processes was conducted. The reliability of these data was evaluated according to preselected criteria of sample source, sampling and analytical methodology, and data source. Data on the following activities were included: coal strip mining, oil refineries, oil shale operations, coal-fired power plants, coal liquefaction processes, coal gasification processes, and geothermal energy production. Using the information collected, areas of inadequate data were identified and sampling sites were selected. Sites were selected to include at least one plant in each of seven energy-related activities. Absorption spectroscopy and mass spectroscopy were employed. Author (GRA)

N83-13284# Texas Engineering Experiment Station, College Station.
BASIC RESEARCH OPPORTUNITIES FOR LASTING FUEL GAS SUPPLIES FROM INORGANIC RESOURCES: REPORT OF A WORKSHOP COLLEGE STATION, 8 JUN. - 14 AUG. 1981 Final Report, 15 Feb. 1981 - 28 Feb. 1982
Kurt J. Irgolic, ed. 28 Feb. 1982 335 p refs Workshop held at College Station, Tex., 8 Jun. - 14 Aug. 1981
(Contract GRI-5081-360-0435)
(PB82-231671; GRI-81/0024) Avail: NTIS HC A15/MF A01 CSCL 21D

The production of fuel gases from inorganic resources using indefinitely sustainable energy sources were studied. Photobiological, biomimetic, photochemical, photoelectrochemical, radiolytic and thermochemical pathways leading to the generation of hydrogen from water and hydrogen sulfide, of carbon monoxide and methane from carbon dioxide, and of nitrogen-based fuel gases from atmospheric nitrogen were assessed. The most likely energy sources to drive the endergonic, fuel-producing reactions are solar radiation, and heat and radiation from nuclear reactors. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-13285# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 14, NO. 9 Monthly Report
Judith Nagle-Eshleman, ed. Sep. 1982 100 p refs
(AD-A119838) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Literature and book reviews, course listings, news briefs, and a bibliography concerned with vibration and shock phenomena in structures are presented. For individual titles, see N83-13286 through N83-13288.

N83-13286# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
SHOCK AND VIBRATION INSTRUMENTATION **c35**
R. Plunkett *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 4, No. 9 Sep. 1982 p 3-5 refs Original document was announced as N78-72683 (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

The current state of the art of transducers, signal processing methods, and novel methods is reviewed. Digital spectrum instruments for data reduction are particularly discussed. M.G.

N83-13287# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
NONLINEAR ANALYSIS OF BEAMS. PART 2: FINITE ELEMENT METHODS **c39**
M. Sathyamoorthy *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 9 Sep. 1982 p 7-18 refs (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

A review of literature addressing the use of finite element methods for nonlinear static and dynamic analysis of beams and beam type structures is presented. Large amplitude vibration and deflection and post buckling behaviors of curved and straight beams are discussed. A bibliography is included. M.G.

N83-13288# Portland State Univ., Oreg. Dept. of Mechanical Engineering.
CURRENT METHODS FOR ANALYZING DYNAMIC CABLE RESPONSE, 1979 TO THE PRESENT **c39**
H. Migliore and R. L. Webster *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 4, No. 9 Sep. 1982 p 19-24 refs (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Techniques in modeling general cable behavior, variable length effects, and surface excitation phenomena are discussed. Emphasis is on ocean engineering applications and closely related activities. Two general computer oriented approaches are predominant: the finite element method and the method of weighted residuals. M.G.

N83-13289# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
WAVE PROPAGATION EFFECTS ON THE HEAVE DYNAMICS OF LARGE AIR CUSHION PLATFORMS
M. J. Hinchey, P. A. Sullivan, and A. Dupuis Aug. 1982 34 p refs
(UTIAS-TN-234; ISSN-0082-5263) Avail: NTIS HC A03/MF A01

Acoustic effects on the heave dynamics of large air cushion platforms are explored theoretically. The models developed for an axisymmetric geometry show that when the cushion air is fed centrally through an orifice feed hole the stable pressure-flow operating region can be much smaller than that indicated by the

commonly used lumped capacitance model which by definition totally ignores acoustic effects. Author

N83-13290# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
HEAVE STABILITY OF AIR CUSHION VEHICLES HOVERING OVER DEEP WATER
M. J. Hinchey Aug. 1982 26 p refs
(UTIAS-TN-236; ISSN-0082-5263) Avail: NTIS HC A03/MF A01

The heave stability of air cushion vehicles hovering over infinitely deep water is examined theoretically. When applied to the Canadian National Research Council craft, HEX-5, the theory predicts that the volume modulation produced by the spatially averaged deflection of the plenum water free surface would increase the stable operating region relative to overland operation. The air flow modulation produced by deflection of the water free surface at the lip of the plenum on the other hand would cause unstable behavior at low cushion pressures. Author

N83-13291*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Missile Systems Div.
HIGH-SPEED MACHINING OF SPACE SHUTTLE EXTERNAL TANK (ET) PANELS Final Report
Joseph A. Miller 15 Sep. 1982 81 p
(Contract NAS8-34508)
(NASA-CR-170676; NAS 1.26:170676; LMSC-D880308) Avail: NTIS HC A05/MF A01 CSCL 13H

The applicability to and advantages of the high-speed machining process for the production of Space Shuttle external tank panels by physically machining selected sample portions of an external tank panel were investigated. The panel sample configuration was selected, and potential high speed milling procedures identified. An 8 foot long panel was machined and the milling demonstration is described in detail. J.D.

N83-13292# Hydronautics, Inc., Laurel, Md.
SELF RESONATING PULSED WATER JETS FOR AIRCRAFT COATING REMOVAL: FEASIBILITY STUDY
Georges L. Chahine, Virgil E. Johnson, Jr., and Gary S. Frederick Jun. 1982 90 p refs
(Contract N00014-82-C-0143)
(AD-A119114; TR-8268-1) Avail: NTIS HC A05/MF A01 CSCL 13/8

The objective of this project was to investigate the feasibility of disrupting a high pressure water jet into a discrete train of well organized slugs through passive acoustic self-excitation of the jet, and as a result to enhance the ability of the jet to remove aircraft coatings and to prepare surfaces for recoating. This innovative technique takes advantages of the water hammer pressures produced by the slugs' impact (which are much higher than the stagnation pressures generated by a continuous jet), without the drawbacks of having a mechanical rotating interrupter. In addition this technique provides larger working standoff distances, wider areas of impact and thus greater control of the energy imparted to a target than a cavitating jet. It is therefore capable of overcoming the drawbacks of existing water jet methods in preparing aircraft surfaces for repainting and of providing a primary supplement if not a practical replacement for chemical removal methods. GRA

N83-13293# Ohio State Univ., Columbus. Research Foundation.
PACKING OF OXIDE CERAMIC POWDERS BY CENTRIFUGAL CASTING
G. W. Shaffer and D. W. Readey Sep. 1982 101 p refs
(Contract N00014-80-C-0523)
(AD-A119350) Avail: NTIS HC A06/MF A01 CSCL 11/2

Topical commercially available powders of silica, zinc oxide, tin oxide, and alumina were centrifugally cast. The purpose of the study was to determine the feasibility of centrifugal casting well-dispersed slips of such ceramic oxide powders to obtain high green densities and to observe the effects that deviations from an ideal monodisperse, spherical powder have on the resulting packing density. The powders were characterized by particle size distributions and microscopy. Viscosity versus pH data were obtained for those powders for which there was a sufficient quantity. The results generally showed a good correlation of centrifugal casting density with the degree of powder dispersion as measured by viscosity. However, the packing densities obtained were not higher than those which can be obtained by conventional slip casting or dry pressing. It can be concluded that centrifugal casting of typical ceramic powders does not offer any advantage over other consolidation processes. Author (GRA)

N83-13294# National Engineering Lab., East Kilbride (Scotland). Metals Technology Dept.
CASTING CRITICAL COMPONENTS
R. McCallum Jun. 1982 18 p Sponsored by British Investment Casting Trade Association (BICTA)
(NEL-681) Avail: NTIS HC A02/MF A01

Investment casting is an essential processing route for critical rotating and static aero gas turbine components and for a wide spectrum of high integrity parts. These must perform reliably under arduous operating conditions involving high stresses and, frequently, extremely hostile environments. The advanced technology, in-process controls, rigorous specifications, and stringent testing and inspection procedures required for high integrity investment castings are considered along with some examples of the technological 'spin-off' into diverse industry sectors. Author (ESA)

N83-13295# Rolls-Royce Ltd., Derby (England).
UTILIZATION OF SILICA SOL FOR MAKING MOULDS FOR EXPENDABLE PATTERNS
A. D. Chulkova, N. A. Shabanova, Y. I. Rastegin, and V. N. Ivanov Mar. 1982 4 p Transl. into ENGLISH from Liteynoe Proizv. (USSR), no. 11, 1981 p 16-17
(PNR-90125; Trans-16068; TLT-00868) Avail: NTIS HC A02/MF A01

The application of silica sol with up to 50% SiOZ in water and pH 9 to 9.5 to produce expendable cores for metal castings was studied. The binding properties of the sol and the mechanical properties of the dryed sol-quartz specimens were investigated. Compared with ethylsilicate suspensions, the silica sols show poorer binding properties and lower mechanical strength of the dried specimen at room temperature. At 900 C, however, the mechanical strength is equivalent to that of ethylsilicate suspensions. The properties of mixtures of silica sol and ethylsilicate were examined and large scale tests were done in an industrial foundry. The tests show that the proportion of ethylsilicate may be reduced to 50% without sacrifice of mechanical properties. Author (ESA)

N83-13296# Rolls-Royce Ltd., Derby (England).
NEW TRENDS IN METAL FORMING IN THE USA
May 1982 4 p Transl. into ENGLISH from Tranciatura Stampaggio (Italy), v. 15, pt. 11/12, Dec. 1978 p 69-70
(PNR-90143; Trans-16264; TLT-00883) Avail: NTIS HC A02/MF A01

The use of lasers in sheet metal stamping, hydraulic presses, cold pressing, and deformation of titanium alloy to produce components which do not require subsequent machining are discussed. Superplastic deformation techniques could lead to cost savings of 90% in the aerospace industry. Precision forging and welding technologies can considerably reduce raw material costs, but investment costs are high. Author (ESA)

N83-13297# Rolls-Royce Ltd., Derby (England).
PNEUMATIC FORMING OF TITANIUM ALLOYS UNDER SUPERPLASTIC CONDITIONS
E. V. Skuridin, Y. V. Gusev, O. M. Smirnov, and O. V. Panfilova May 1982 6 p refs Transl. into ENGLISH from Zuznechno Shtampovochnoe Proizvodstvo (USSR), v. 18, no. 6, 1976 p 17-19
(PNR-90145; Trans-16301; TLT-00892) Avail: NTIS HC A02/MF A01

The influence of the initial alloy structure on the extent to

which superplastic properties are induced is discussed. Maximum admissible deformation rate in the superplastic range and the relative extension of the sample to rupture were found to be inversely proportional to the grain size of the alloy in its initial state. A coarsening of the structure was accompanied by an appreciable increase in the deformation resistance under optimal temperature-rate conditions. A method for producing containers by pneumatic forming under superplastic conditions without the need for forming equipment is described. It uses nonuniform local zones in the initial structure as reinforcing ribs, which determine the magnitude and direction of the plastic deformation and the shape of the finished product. The method can be used for the manufacture of bellows, cylinders, and containers from titanium alloy plate. Author (ESA)

N83-13298# Rolls-Royce Ltd., Derby (England).
CONTROL OF THE DISTRIBUTION OF THICKNESS IN THE PNEUMOTHERMAL FORMING OF LAMELLAR PARTS IN CONDITIONS OF SUPERPLASTICITY
A. G. Pashkevich, A. V. Orekhov, and Y. P. Tioupich May 1982 17 p refs Transl. into ENGLISH of Kuznechno-Shtampov (U.S.S.R.), Pt. 8, Aug. 1978 p 36-39
(PNR-90144; Trans-16265; TLT-00884) Avail: NTIS HC A02/MF A01

Experimental methods for reducing the uneveness of wall thickness in pressure formed dome shaped metal parts are discussed. The experimental equipment and conditions are detailed. Several ways of controlling thickness were studied including the use of movable mold parts in multistage operation and by obtaining temperature profiles in the material by heating or cooling selected areas. Those methods are proposed for practical use although the choice of a specific method must be decided by the geometrical and material parameters. Author (ESA)

N83-13299# Istituto di Studi per la Programmazione dei Sistemi Ambientali s.r.l., Milan (Italy).
PERSONNEL PROTECTION MEANS. PART 1: SAFETY SUPERVISOR MANUAL [MEZZI PERSONALI DI PROTEZIONE. N. 1: MANUALE AD USO DEI PREPOSTI]
1982 34 p In ITALIAN 3 Vol.
Avail: NTIS HC A03/MF A01

A manual for use by a safety supervisor in an industrial environment is presented. Italian laws governing safety regulations are reviewed. The main criteria for the choice of safety equipement and for its acquisition, test, distribution and maintenance are discussed. The responsibilities of the safety supervisor are described. Author (ESA)

N83-13300# Istituto di Studi per la Programmazione dei Sistemi Ambientali s.r.l., Milan (Italy).
PERSONNEL PROTECTION MEANS. PART 2: METHODOLOGY FOR SAFETY ANALYSIS [MEZZI PERSONALI DI PROTEZIONE. N. 2: METODOLOGIA PER L'INDAGINE]
1982 13 p In ITALIAN 3 Vol.
Avail: NTIS HC A02/MF A01

A method for the analysis of safety risks and for the choice of adequate safety means in an industrial environment is proposed. An analysis worksheet is presented in which parts of the human body and the risk factors are cross-related. Another worksheet for the evaluation of the efficiency of the proposed safety means is also described. Author (ESA)

N83-13301# Istituto di Studi per la Programmazione dei Sistemi Ambientali s.r.l., Milan (Italy).
PERSONNEL PROTECTION MEANS. PART 3: MANAGEMENT METHODOLOGY [MEZZI PERSONALI DI PROTEZIONE. N. 3: METODOLOGIA PER LA GESTIONE]
1982 55 p In ITALIAN 3 Vol.
Avail: NTIS HC A04/MF A01

A management procedure for the analysis and control of safety activities in an industrial environment is presented. A diagram consisting of ten decision or activity blocks summarizes the proposed method. Each block is analyzed in detail, and worksheets are included, covering the control, evaluation and analysis activities of each step of the procedure. Author (ESA)

N83-13302*# National Aeronautics and Space Administration, Washington, D. C.
NASA EDUCATION BRIEFS FOR THE CLASSROOM. METRICS IN SPACE
1982 3 p
(NASA-EB-82-2) Avail: NTIS HC A02/MF A01 CSCL 05B

The use of metric measurement in space is summarized for classroom use. Advantages of the metric system over the English measurement system are described. Some common metric units are defined, as are special units for astronomical study. International system unit prefixes and a conversion table of metric/English units are presented. Questions and activities for the classroom are recommended. J.D.

N83-13303# Technical Research Centre of Finland, Espoo.
BUILDING FOUNDATIONS UNDER DIFFICULT GEOLOGICAL CONDITIONS. SEMINARS OF FINNISH AND SOVIET EXPERTS
1980 378 p refs In RUSSIAN and ENGLISH
(PB82-201948; VTT/Symposium-8; ISBN-951-38-0909-9; ISSN-0357-9387) Avail: NTIS HC A17/MF A01 CSCL 13M

The stress-strain properties of soils are investigated. The bearing capacity of plastically nonhomogeneous deep foundations limited and unlimited by rigid underlayers of soft underlying layers are studied. The subsoil improvement by means of vertical drainage is studied. S.L.

N83-13304# Technical Research Centre of Finland, Espoo.
TECHNOLOGICAL OPERATIONS IN QUALITY CONTROL OF CONCRETE
1981 110 p refs
(PB82-201997; VTT/Symposium-11; ISBN-951-38-1221-9; ISSN-0357-9387) Copyright. Avail: NTIS HC A06/MF A01 CSCL 13C

Results of Finnish and Soviet cooperative research in producing quality concrete for the construction industry are reported in 10 conference papers. Topics covered include: quality ensurance for front surfaces on enclosed structures; high temperature treatment of concrete while producing precast products; a complex system for producing quality control at precast concrete factories; roll pressing flat concrete and reinforced concrete products; creating a thermally active protective layer of concrete for accelerating the hardening of large size products; infrared heating of concrete in construction site conditions; national codes for winter concreting; quality control tests for frost resistance; compressive strength of concrete using NDT; and accelerated life tests in Finland. GRA

N83-13305# Transport and Road Research Lab., Crowthorne (England). Tunnels and Underground Pipes Div.
GROUND MOVEMENTS CAUSED BY DEEP TRENCH CONSTRUCTION IN AN URBAN AREA
A. F. Toombs, C. McCaul, and I. F. Symons 1982 37 p refs
(PB82-226762; TRRL-LR-1040; ISSN-0305-1293) Copyright. Avail: NTIS HC A03/MF A01 CSCL 08M

Ground movements caused by the construction of a deep trench through predominantly granular soils for the renewal of storm and foul water sewers in an urban area were investigated. Measurements of both surface and subsurface horizontal ground movements and settlement were made at various distances from the trench at two locations during and after construction. The effects of loading from construction traffic and changes in the method of construction at the two locations on the magnitude and distribution of ground movement are reported. GRA

N83-13306# Cambridge Univ. (England). Dept. of Engineering.
PERFORMANCE AND FINITE ELEMENT ANALYSES OF A TRIAL EMBANKMENT ON SOFT CLAY
M. S. S. Almeida and J. A. Ramalho-Ortigao (Federal Univ. of Rio de Janeiro) 1982 15 p refs Presented at the Intern. Symp. on

Numerical Models in Geomechanics, Zurich, 13-17 Sep. 1982 Sponsored in part by the Brazilian Highway Research Inst. and the Brazilian Research Inst.
(PB82-226945; CUED/D-SOILS/TR-121-1982; ISSN-0309-7439) Avail: NTIS HC A02/MF A01 CSCL 08M

Finite element analyses of a test embankment on soft clay are presented. Two distinct soil mechanics approaches are used; critical state-effective stress theory as embodied in the CRISP program and total stress nonlinear elastic method (FEECON program). Analyses carried out were: elastoplastic undrained, drained and coupled consolidation using the CRISP program; and the elastic non-linear undrained using the FEECON program. GRA

N83-13307# Cambridge Univ. (England). Dept. of Engineering.
CENTRIFUGE STUDIES
A. N. Schofield 1982 17 p refs Presented at the Intern. Conf. on Soil Dyn. and Earthquake Eng., Southampton, Engl., 13-15 Jul. 1982 Submitted for publication
(PB82-226952; CUED/D-SOILS/TR-123-1982) Avail: NTIS HC A02/MF A01 CSCL 08M

The mechanical behavior of a full scale prototype block of saturated soil in Earth's gravity was studied in a small 1/N scale in a model block of saturated similar soil which was brought into equilibrium under Ng in a container in a geotechnical centrifuge. The saturated soil material at all points in the model must be similar in material composition and in state of stress to that which exists at homologous points in the prototype, and the effective stresses and pore pressures in equilibrium at all points on the model boundaries must be the same as on the prototype boundaries. During the initial centrifuge flight time local steady seepage velocities of pore water in the model will be N times higher than in the prototype, but it may still require several hours for diffusion in initial centrifuge flight before saturated soil at all points in the model comes into equilibrium with the same effective stresses, and therefore the same mechanical properties such as stiffness and strength, as exist at homologous points in the prototype. GRA

N83-13308# Geotechnical Engineers, Inc., Winchester, Mass.
LIQUEFACTION INDUCED BY CYCLIC LOADING
G. Castro, J. L. Enos, J. W. France, and S. J. Poulos Mar. 1982 343 p refs
(Grant NSF PFR-79-24731)
(PB82-235508; NSF/CEE-82018) Avail: NTIS HC A15/MF A01 CSCL 08M

The results of a study of liquefaction induced by cyclic loading are presented. Liquefaction and cyclic mobility are defined and compared with published definitions. The steady state of deformation is described and its relationship to liquefaction is discussed. The results of comprehensive laboratory triaxial testing programs on two sands are supplied. The test data demonstrate that, for a given soil, the steady state line is independent of stress history, and the magnitude of cyclic loading required to trigger liquefaction is a function of static shear stress and number of load cycles. The steady state lines for the two sands tested are compared to steady state lines for a variety of other sands. General trends are recorded for variation of steady state lines in rain size distribution and in grain angularity. A procedure for practical application of state state concepts to geotechnical engineering is recommended. GRA

N83-13309# Southwest Research Inst., San Antonio, Tex.
DETERMINATION OF MOISTURE LEVELS IN STRUCTURAL CONCRETE USING PULSED NMR Final Report
G. A. Matzkanin, A. DeLosSantos, and D. A. Whiting Washington Federal Highway Administration Apr. 1982 98 p refs Prepared in cooperation with Portland Cement Association
(Contract DOT-FH-11-9487)
(PB82-230491; FHWA/RD-82/008) Avail: NTIS HC A05/MF A01 CSCL 13C

An investigation has been conducted of nuclear magnetic resonance (NMR) as the basis for nondestructively measuring moisture content in concrete. Results of a laboratory feasibility study conducted on a variety of concrete cylinders showed the NMR signatures to correlate well with evaporable moisture indepdently of cement type, water/cement ratio or chloride content; however, magnetic minerals contained in certain aggregates affected the correlation. On the basis of the feasibility study, an NMR Moisture Measurement system for nondestructively measuring moisture from one surface of reinforced bridge decks was designed and fabricated. GRA

N83-13310# Battelle Columbus Labs., Ohio.
SYMPOSIUM ON PULSE-COMBUSTION APPLICATIONS. VOLUME 1: PROCEEDINGS
Mar. 1982 323 p refs Symp. held in Atlanta, 2-3 Mar. 1982 Sponsored by Brookhaven National Lab. and Gas Research Inst. 2 Vol.
(PB82-240060; BCL-N-4007-1; GRI-82/0009.2-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 13A

Pulse-combustion systems designed to take advantage of the phenomena of combustion-driven pulsations are discussed. Both recent R&D findings and field experience with commercialized equipment are covered. Applications include space heating, water heating, and industrial processes. Pulse-combustion systems are of special current interest because of their potential in firing efficient heating equipment having compact heat exchangers, including those operating in the condensing mode. GRA

N83-13311# Battelle Columbus Labs., Ohio.
SYMPOSIUM ON CONDENSING HEAT EXCHANGERS. VOLUME 2: PROCEEDINGS
Mar. 1982 386 p refs Symp. held in Atlanta, 3-4 Mar. 1982 Sponsored in by Brookhaven National Lab. and Gas Research Inst. 2 Vol.
(PB82-240078; BCL-N-4007-2; GRI-82/0009.3-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 13A

Heat exchangers designed to recover a portion of the latent heat of the water vapor formed in the combustion process are discussed. They are applicable to equipment fired by either conventional power burners or pulse-combustion systems. Heat exchanger concepts and performance, corrosion resistant materials, condensate disposal, venting of flue gases and codes and standards are considered. Applications include use of condensing heat exchangers in conjunction with furnaces for space heating, and also with boilers for generation of steam or hot water for use in space heating or industrial processing. GRA

N83-13312# Swedish Water and Air Pollution Research Lab., Stockholm.
LAKES AS A HEAT SOURCE FOR RESIDENTIAL HEATING: A SURVEY OF COSTS IN COMPARISON WITH DIFFERENT SYSTEMS AND ECOLOGICAL CONSEQUENCES
Thomas Hellstrom May 1982 25 p refs Transl. into ENGLISH of "Sjoar som Varmekalla for BostadsuppBostadsuppvarmning. En Overblick over Kostnader i Jamforelse med Olika System och Ekologiska Konsekvenser" rept. B-557, Stockholm, 4 Jun. 1980 31 p Original language document was announced as N81-21594 (PB82-217019; IVL-B-557) Avail: NTIS HC A02/MF A01 CSCL 13A

The low grade energy in lakes and ground water can be used for residential heating by using heat pumps. An economic comparison of different systems was performed. It was assumed that the temperature of the produced hot water would be 60 C, and that the capacity would be 6500 MWh per year. The production costs were calculated. The ecological consequences are discussed. GRA

N83-13313# American Gas Association Labs., Cleveland, Ohio.
PULSE COMBUSTION FURNACE PHASE 2: ADVANCEMENT OF DEVELOPMENTAL TECHNOLOGY Annual Report, Jan. - Dec. 1981
F. E. Belles and J. C. Griffiths Chicago GRI Apr. 1982 105 p refs
(Contract GRI-5014-341-0112)
(PB82-240052; GRI-81/0073) Avail: NTIS HC A06/MF A01 CSCL 13A

The development of pulse combustion technology, with specific application to furnaces with ultrahigh efficiency is discussed. The performance of a series of pulse combustion burner designs with various input spans within an overall framework of 15,000 to 300,000 Btu per hour was observed. These data are intended to assist designers in selecting appropriate burner component designs to meet their particular needs and also, to provide the means to relate various burner design factors to burner performance, particularly in regards to noise of operation. GRA

N83-13314# Sydney Univ. (Australia). School of Civil and Mining Engineering.
INFLUENCE OF SHAFT LENGTH ON PILE LOAD CAPACITY IN CLAYS
H. G. Poulos Sep. 1981 18 p refs Sponsored in part by Australian Research Grants Committee
(PB82-232265; R-402) Avail: NTIS HC A02/MF A01 CSCL 13B

It is shown that, for long compressible piles, the load required to cause a head settlement of 10% of the pile diameter may be significantly less than the ultimate load capacity. A dimensionless solution is provided to enable rapid estimation of the combined effects of length and compressibility on the practical load capacity of a pile. GRA

N83-13315# Diecasting Society of India, New Delhi.
DIECASTING
1982 18 p
(PB82-215682) Avail: NTIS HC A02/MF A01 CSCL 13H

Anodizing of zinc is discussed. The redesign of a pocket hand drill is reported. Clay-graphite and silicon carbide crucibles are also discussed. S.L.

N83-13316# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
LASER INDUCED DEPOSITION OF THIN FILMS Final Annual Report, Apr. 1981 - May 1982
John S. Haggerty, T. Gattuso, and M. Meunier May 1982 46 p refs Sponsored in part by Minnesota Mining and Manufacturing Co.
(PB82-231036; MIT/EL-82-022) Avail: NTIS HC A03/MF A01 CSCL 13H

A chemical vapor deposition (CVD) process was demonstrated with Si thin films. In this process, reactant gases are heated by absorbing light energy emitted from an IR laser. No other surfaces are heated by the reaction, thus contamination is eliminated, the state (stress, crystalinity, grain size, etc.) of the film can be controlled and unwanted heterogeneous reaction sites are eliminated. Research conducted to date employed silane (SiH4) as a reactant and an untuned CO2 laser. Process conditions appropriate for film deposition were defined. Deposition kinetics, film characteristics and mixed gas optical absorptivities were measured. Deposition rates are comparable to other low pressure CVD processes (about 1-10 A/sec) but with much colder substrate temperatures being permitted. The characteristics of initial amorphous Si films indicate that they equal or exceed the quality of films deposited by highly developed plasma or reactive sputtering techniques. GRA

N83-13317# Cornell Univ., Ithaca, N. Y. School of Operations Research.
DESIGN OF AUTOMATIC GUIDED VEHICLE SYSTEMS
W. L. Maxwell and J. A. Muckstadt Feb. 1982 38 p refs
(Grant NSF MEA-79-24777)
(PB82-232646; NSF/MEA-82001; TR-504) Avail: NTIS HC A03/MF A01 CSCL 13H

Analysis techniques and a methodological framework for specifying the operational characteristics of an automatic guided vehicles system (AGVS) are presented. It is shown that the design of an AGVS can determine the minimum number of vehicles required in a system. A large scale integer program which can be formulated to include such factors as time phased pickup and dropoff requirements, pickup and dropoff area floor space capacity, and track congestion is shown to be intractable. Rather, a simple time dependent model which can be used to find the minimum number of vehicles is suggested. Other analysis tools for evaluating time dependent behavior of an AGVS are supplied. A procedure for dispatching vehicles is developed and a method for measuring the blocking time caused by congestion is provided. GRA

N83-13318# Transport and Road Research Lab., Crowthorne (England). Bridges Div.
THE FLEXURAL PERFORMANCE OF 3.5m CONCRETE BEAMS WITH VARIOUS BONDED EXTERNAL REINFORCEMENTS
M. D. Mcdonald 1982 46 p refs
(PB82-226788; TRRL-Supplementary-728; ISSN-0305-1315) Copyright. Avail: NTIS HC A03/MF A01 CSCL 13C

Tests on seventeen 3.5 m long reinforced concrete beams with epoxy bonded external reinforcement subjected to 4 point bending are reported. The variables included different adhesives, plate geometries, a jointed plate, glue line thickness, partial bonding and multilayered plates. The beams were also tested as cast (for reference), plated without the concrete being cracked (plated as cast) and plated after cracking (plated precracked). GRA

N83-13319# National Bureau of Standards, Washington, D.C.
INTERNAL STRAIN, DEFORMATION, AND FAILURE OF LARGE SCALE PULLOUT TESTS IN CONCRETE
Willian C. Stone May 1982 177 p refs
(PB82-229147; NBSIR-82-2484) Avail: NTIS HC A09/MF A01 CSCL 13C

Detailed experimental data on crack propagation and internal strain distribuion for the pullout test is presented. A 12:1 scaled-up pullout test was designed, using a commercial pullout insert for the prototype dimensions, and was instrumented with small waterproof embedment strain gages so as to obtain internal strain profiles at critical locations. Two large scale specimens were tested with apex angles falling at the upper and lower bounds currently recommended in ASTM C-900. Two dimensional axisymmetric finite element analyses were performed for the two experimental specimens and the results were compared with measured strains for load stages below the onset of internal cracking. GRA

N83-13320# Transportation Research Board, Washington, D.C.
AIRPORT LANDSIDE OPERATIONS AND AIR SERVICE
Peter B. Mandle, E. M. Whitlock, Frank LaMagna, Ray A. Mundy, and Phillip J. Oberhausen 1982 44 p refs
(PB82-235946; TRB/TRR-840; ISBN-0-309-03317-9; ISSN-0361-1981; LC-82-12456) Avail: NTIS HC A03/MF A01; HC also available from Transportation Research Board, 2101 Constitution Ave., NW, Washington, D.C. 20418 CSCL 13B

The following areas are discussed: airport curbside planning and design; analysis of New Orleans airport ground transportation system; time series analysis of intercity air travel volume; economic justification of air service to small communities; and general aviation and the airport and airway system (an analysis of cost allocation and recovery). GRA

N83-13321# Transportation Research Board, Washington, D.C.
SOIL STABILIZATION 1982
Ernest J. Barenberg, Marshall R. Thompson, S. D. Tayabji, P. J. Nussbaum, and A. T. Ciolko 1982 49 p refs
(PB82-235953; TRB/TRR-839; ISSN-0361-1981; ISBN-0-309-03316-0; LC-82-12409) Avail: NTIS HC A03/MF A01; HC also available from Transportation Research Board, 2101 Constitution Avenue, NW, Washington, D.C. 20418 CSCL 13B

Seven papers cover the following areas: design, construction and performance of lime, fly ash, and slag pavement; evaluation of heavily loaded cement stabilized bases; coal refuse and fly ash compositions; potential highway base course materials; lime soil mixture design considerations for soils of southeastern United States; short term active soil property changes caused by injection of lime and fly ash; soil cement for use in stream channel grade stabilization structures; and reaction products of lime treated southeastern soils. GRA

N83-13322# Texas Univ., Austin. Center for Transportation Research.
A DESIGN SYSTEM FOR RIGID PAVEMENT REHABILITATION Interim Report
Stephen B. Seeds, B. F. McCullough, and W. R. Hudson Jan. 1982 332 p refs
(CTR Proj. 3-8-79-249)
(PB82-238650; CTR-3-8-79-249-2; FHWA/TX-81/41-249-2) Avail: NTIS HC A15/MF A01 CSCL 13B

The development, use, and applicability of a rigid pavement rehabilitation design system, RPRDS, developed for use by the Texas State Department of Highways and Public Transportation is described. Like other pavement design systems, RPRDS makes use of the systems approach to incorporate a number of pavement design and analytical models into a computer program, RPRDS-1, for the generation, analysis, and comparison of numerous pavement design strategies. Basically, RPRDS generates a number of feasible overlay design strategies based on user inputs, performs a present value cost analysis on each, and then presents those which are optimal. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-13323* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SERIAL DATA CORRELATOR/CODE TRANSLATOR Patent
Larry E. Morgan, inventor (to NASA) Issued 9 Nov. 1982 6 p Filed 27 Jul. 1979 Supersedes N79-28383 (17 - 19, p 2532)
(NASA-Case-KSC-11025-1; US-Patent-4,358,846; US-Patent-Appl-SN-061327; US-Patent-Class-371-6) Avail: US Patent and Trademark Office CSCL 17B

A system for analyzing asynchronous signals containing bits of information for ensuring the validity of said signals, by sampling each bit of information a plurality of times, and feeding the sampled pieces of bits of information into a sequence controlled is described. The sequence controller has a plurality of maps or programs through which the sampled pieces of bits are stepped so as to identify the particular bit of information and determine the validity and phase of the bit. The step in which the sequence controller is clocked is controlled by a storage register. A data decoder decodes the information fed out of the storage register and feeds such information to shift registers for storage.
Official Gazette of the U.S. Patent and Trademark Office

N83-13324 Ohio State Univ., Columbus.
RELATIONSHIP BETWEEN THE ADAPTIVE PERFORMANCE OF ANTENNA ARRAYS AND THEIR UNDERLYING ELECTROMAGNETIC CHARACTERISTICS Ph.D. Thesis
Inder Jeet Gupta 1982 162 p refs
Avail: Univ. Microfilms Order No. DA822091

A direct relationship between the conventional array characteristics of an antenna array and its performence in an adaptive mode is established. Expressions to obtain the output signal-to-interference-plus-noise ratio (SINR) of an adaptive array in terms of its unperturbed pattern (the radiation pattern of the array responding to a desired signal in the absence of any interfering signal) and the locations of the desired signal and jammers are provided. These expressions permit the evaluation of the performance of an adaptive array without an exhaustive search of all possible signal-jammer scenarios and parametric values. An algorithm to select element location of one dimensional arrays is presented. The algorithm leads to thinned arrays which provide the required performance level in a two dimensional field of view. The one dimensional approach is extended to provide planar arrays for aircraft and satellite adaptive antenna systems. Dissert. Abstr.

N83-13325 Ohio Univ., Athens.
INVESTIGATION AND DEVELOPMENT OF VHF GROUND-AIR PROPAGATION COMPUTER MODELING INCLUDING THE ATTENUATING EFFECTS OF FORESTED AREAS FOR WITHIN-LINE-OF-SIGHT PROPAGATION PATHS Ph.D. Thesis
Kent Alan Chamberlain 1982 234 p
Avail: Univ. Microfilms Order No. DA8224251

The development of a short-range (5-100 nm) air-ground, VHF propagation model is presented. Signal strength estimates are calculated by this model using GTD techniques to determine ground scattering effects in addition to a novel aproach for predicting attenuation due to forested areas. The utility of the model is to enable satisfactory siting of VHF (118-136 MHz) ground-air communications facilities. Confirmation of accurate model performance is obtained via comparisons of model outputs with measured signal strength data that were collected specialy for this study. A description of data collection is given, detailing measurement equipment, site conditions, and data reduction. An overview of contemporary propagation modeling techniques is also included which describes theory of operation, deficiencies and accuracy.
Dissert. Abstr.

N83-13326 Iowa State Univ. of Science and Technology, Ames.
ATMOSPHERIC ANISOTROPY AND ITS EFFECT ON THE DELAY POWER SPECTRA OF TROPOSPHERIC SCATTER RADIO SIGNALS Ph.D. Thesis
Hosny Mohammad Ibrahim 1982 140 p
Avail: Univ. Microfilms Order No. DA822242225

The atmospheric anisotropy and its effect on the delay power spectra of signals received on troposcatter radio links were studied. A simplified model for determining an anisotropy coefficient is suggested. Theoretical and measured anisotropy profiles are utilized in the calculations of the delay power spectra of tropospheric links. The impact of the anisotropy on the troposcatter channel as a communication link is studied. Bello's model for the troposcatter channel is modified to include the effect of the anisotropy on the delay power spectra. Several theoretical anisotropy profiles based on the experimental observations and the corresponding spectra are evaluated. It was found that the anisotropy results in increased multipath spread and mean delay parameters. This has a direct effect on the irreducible bit error rate (BER) due to intermodulation distortion. Calculations indicate that an order of magnitude increase in the BER due to the atmospheric anisotropy could result. Dissert. Abstr.

N83-13327 Polytechnic Inst. of New York, Brooklyn.
ADAPTIVE ROBUST AND NONPARMETRIC PROCEDURES WITH APPLICATION TO COMMUNICATIONS, RADAR, SONAR AND ARRAY SIGNAL PROCESSING Ph.D. Thesis
Radomir Aleksandar Mihajlovic 1982 210 p
Avail: Univ. Microfilms Order No. DA8217339

The qualitative aspects of robustness in the signal detection framework is addressed. Local and global robustness properties of the detector are investigated and various approaches to the quantitative and qualitative characterization of the robutness are introduced. The measures of robustness are easy to calculate and provide valuable information about performance of the detector in a severe noise environment. Of particular interest to the designer is the efficacy robustness curve (ERC) and the efficacy loss density curve (ELDC) which provide information pertaining to two conflicting performance criteria: insensitivity to impulsive noise contamination and efficacy (power). Based on the proposed performance measures and descriptors some detectors, such as, the linear or the quadratic detector are shown to be nonrobust. Their comparison in adverse noise conditions with what is considered as robust detectors, in the framework of the presented theory, is improper. Dissert. Abstr.

N83-13328 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
AN EXPERIMENTAL REALIZATION OF A FUNDAMENTAL PATTERN SYNTHESIS FOR ANTENNAS WITH ROTATIONAL SYMMETRY

W. Soentgerath and C. vonWinterfeld Jan. 1982 29 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteidigung
(Rept-1-82) Copyright. Avail: Issuing Activity

The experimental realization consisted of a four slot cross disposed antenna, excited by waveguides of square section producing vector-phased modes. The vector-phased modes are produced by 4 summators, 16 phase shift circuits, and 8 three dB attenuators. The four measuring circuits consist of an oscillator exciting the antenna and also the HF receiver, and an analog-digital converter. A multiplexer connected to the four measuring circuits feeds a data accumulator. A computer analyzes data. Calculated and measured pattern diagrams are compared for the different modes, and the possibility of rotating the field pattern in azimuth and simultaneously phase the polarization in elevation by adapting the phase modes, is shown. Author (ESA)

N83-13329 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
COMPUTER AIDED MEASUREMENT OF MULTIMODE FIELDS IN WAVEGUIDES
C. vonWinterfeld and E. Zocher Feb. 1982 26 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteidigung
(Rept-2-82) Copyright. Avail: Issuing Activity

A method for computer aided measurement to analyze closed and open multimode structures, e.g., waveguides, travelling wave structures, is presented. Measurements are realized with a sonde having a very low coupling coefficient with relation to waveguides positioned manually, and connected through an attenuator to a differential analyzer connected at the other hand to the signal generator. The phase and amplitude values are digitized, and fed to a computer. The obtained values are then further analyzed in a larger computer. Precision of measurements attained is plus minus two grad and plus or minus 0.2 dB. The mathematical solution of the nonlinear equations system is an application of the Prony algorithm to waves in a medium with axial translational symmetry. The method was tested by measuring multimodal fields in a circular waveguide with smooth walls. Based on fairly accurate field data, the results of the analysis are checked, the accuracy of the wave number values is established, and the optimum parameters of the analysis are obtained. Author (ESA)

N83-13330 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
A NUMERICAL METHOD TO CALCULATE PERISCOPE ANTENNAS
E. Ludwig and C. vonWinterfeld Feb. 1982 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteidigung
(Rept-3-82) Copyright. Avail: Issuing Activity

After establishing the radiation field of a parabolic mirror irradiated by a Huygens optical source, the effect of a plane reflecting mirror was determined by assimilating the mirror to an iris with an opening depending from the mirror projection in the radiation direction. Numerical application is presented taking into account the focal distance of the system, and the opening angle of the parabolic antenna leading to a simple antenna optimization. Author (ESA)

N83-13331 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
PROPERTIES OF SCALAR ANTENNA ARRAYS IN A SIMPLE DUCT WITH A VARYING SURFACE LAYER
O. Schmid and C. vonWinterfeld Feb. 1982 36 p refs In GERMAN; ENGLISH summary
(Contract BMVg-TRF-37/A-0003/A-1303)
(Rept-4-82) Copyright. Avail: Issuing Activity

Effects of a reflecting duct, consisting on the lower side of a horizontal plane surface and on the top side of a static sinusoidal surface, on acoustic waves emitted at a certain distance from the antenna were studied. The mathematical functions, containing as main parameters the geometrical disposition, the energy conversion coefficient of the antenna elements, the reflection characteristics, the form of the reflecting surface, and the relative position of reflecting surface and antenna, are established. Numerical applications, using directly measurable parameters for typical excitations of linear and circular arrays, are presented. Author (ESA)

N83-13332*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK: NOISE TEMPERATURE CONCEPTS, MEASUREMENTS, AND PERFORMANCE
C. T. Stelzried 15 Sep. 1982 156 p ref Sponsored by NASA (NASA-CR-169520; JPL-Pub-82-33; NAS 1.26:169520) Avail: NTIS HC A08/MF A01 CSCL 20N

The use of higher operational frequencies is being investigated for improved performance of the Deep Space Network. Noise temperature and noise figure concepts are used to describe the noise performance of these receiving systems. The ultimate sensitivity of a linear receiving system is limited by the thermal noise of the source and the quantum noise of the receiver amplifier. The atmosphere, antenna and receiver amplifier of an Earth station receiving system are analyzed separately and as a system. Performance evaluation and error analysis techniques are investigated. System noise temperature and antenna gain parameters are combined to give an overall system figure of merit G/T. Radiometers are used to perform radio "star" antenna and system sensitivity calibrations. These are analyzed and the performance of several types compared to an idealized total power radiometer. The theory of radiative transfer is applicable to the analysis of transmission medium loss. A power series solution in terms of the transmission medium loss is given for the solution of the noise temperature contribution. A.R.H.

N83-13333*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODULATION/DEMODULATION TECHNIQUES FOR SATELLITE COMMUNICATIONS. PART 3: ADVANCED TECHNIQUES. THE NONLINEAR CHANNEL
Jim K. Omura and Marvin K. Simon 1 Oct. 1982 94 p refs Sponsored by NASA
(NASA-CR-169514; JPL-Pub-81-73-Pt-3; NAS 1.26:169514) Avail: NTIS HC A05/MF A01 CSCL 17B

A theory for deducing and predicting the performance of transmitter/receivers for bandwidth efficient modulations suitable for use on the nonlinear satellite channel is presented. The underlying principle used throughout is the development of receiver structures based on the maximum likelihood decision rule and aproximations to it. The bit error probability transfer function bounds developed in great detail in Part 4 is applied to these modulation/demodulation techniques. The effects of the various degrees of receiver mismatch are considered both theoretically and by numerous illustrative examples. Author

N83-13334# Communications Satellite Corp., Clarksburg, Md.
STUDY OF VARIOUS SYSTEM ASPECTS RELATED TO THE USE OF STANDARD-C SHIP EARTH STATIONS IN THE INMARSAT SYSTEM Final Report
[1981] 599 p refs Sponsored by International Maritime Satellite Organization
(CSC-820915/BR63) Avail: NTIS HC A25/MF A01

Various system aspects related to the use of L-band standard-C ship Earth stations in the INMARSAT system are examined including propagation, modulation/coding, and antenna design. A time domain simulation model for the L-band satellite-to-ship multipath channel is developed which has the physical parameters as its inputs, such as SES-to-satellite elevation angle, sea state conditions, SES antenna characteristics (including antenna gain between 0 dBi and 10 dBi, sidelobes, and polarization purity), and ship motion. The model has cumulative probability distribution; power spectral density; and multipath fade duration, depth, and rate as outputs for communications systems design. A.R.H.

N83-13335# Communications Research Centre, Ottawa (Ontario). Radar and Communications Technology Branch.
MEASUREMENTS AT 11 AND 17 GHz OF TERRESTRIAL MICROWAVE FADING AND DEPOLARIZATION
R. S. Butler Sep. 1982 76 p refs
(CRC-1358) Avail: NTIS HC A05/MF A01

A microwave propagation experiment conducted in the 11 GHz and 17 GHz frequency ranges on two adjacent 16 km paths is discussed. Direct and cross polarized signal levels were measured for six months and significant attenuation and depolarization were observed during periods of rainfall as well as certain times when the atmosphere was clear. Statistics of the durations and of the rates of change of attenuation are presented. The relation of depolarization during rainfall to the canting angles of raindrops is also discussed, and a procedure is developed by which the statistics of the canting angles are obtained. The magnitudes of attenuation during rainfall and attenuation in clear air, and of depolarization in both circumstances, are compared and assessed for their effects on microwave communication system design. S.L.

N83-13336# National Severe Storms Lab., Norman, Okla.
CONSIDERATIONS FOR THE DESIGN OF GROUND CLUTTER CANCELERS FOR WEATHER RADAR Final Report, Feb. 1981 - Jan. 1982
Dusan S. Zrnic, Said Hamidi, and Allen Zahrai Washington FAA Jan. 1982 35 p refs
(Contract DTFA01-80-Y-10524)
(FAA-RD-82-68) Avail: NTIS HC A03/MF A01

Effects of the ground clutter ring in the second trip area for velocity estimation are investigated. Beside unfavorable effects on weather signal due to range square advantage, the clutter poses a new problem when interlaced samples for assigning correct ranges to velocity estimates are used. The problem arises because signals that generate reflectivity estimates for power comparisons cannot be filtered in the same manner as signals from which velocity estimates are generated. Therefore, comparison of powers in the reflectivity and velocity channels is required. Performance of a third order recursive elliptic filter is analyzed. The filter operates best in steady state, but it can also be made to operate in transient by properly initializing it memory elements. Performance on 8 simulated time samples shows that about 10 dB of clutter to signal margin is lost for power and 20 dB for mean velocity estimation; with such a small number of samples, the width estimate is useless. In order for spectrum width biases to be less than 1 m.s-1, a longer train of pulses must be employed on an initialized filter and several of the leading pulses must be used exclusively to further reduce the transients. These problems do not arise when canceling is done on an uninterrupted pulse train. B.W.

N83-13337*# California Univ., Berkeley.
AT WHAT WAVELENGTHS SHOULD WE SEARCH FOR SIGNALS FROM EXTRATERRESTRIAL INTELLIGENCE? (SETI/ INFRARED COMMUNICATION/INTERSTELLAR COMMUNICATION/EXTRATERRESTRIAL INTELLIGENCE)
C. H. Townes [1979] 19 p refs
(Grant NGL-05-003-272)
(NASA-CR-169546; NAS 1.26:169546) Avail: NTIS HC A02/MF A01 CSCL 17B

Searches for extraterrestrial intelligence concentrate on attempts to receive signals in the microwave region, the argument being given that communication occurs there at minimum broadcasted power. Such a conclusion is shown to result only under a restricted set of assumptions. If generalized types of detection are considered, in particular photon detection rather than linear detection alone, and if advantage is taken of the directivity of telescopes at short wavelengths, then somewhat less power is required for communication at infrared wavelengths than in the microwave region. Furthermore, a variety of parameters other than power alone can be chosen for optimization by an extraterrestrial civilization. S.L.

N83-13338# Grumman Aerospace Corp., Bethpage, N.Y. System Engineering Dept.
PILOT ABILITY TO UNDERSTAND SYNTHETIC VOICE AND RADIO VOICE WHEN RECEIVED SIMULTANEOUSLY
Elliott Manaker Jun. 1982 55 p refs
(AD-A119137; ACT-R-82-01) Avail: NTIS HC A04/MF A01 CSCL 05/10

The goals of a prior study were to determine if synthetic voice messages would reduce the F-14 aircraft pilot's workload, increase his effectiveness during the mission, and to establish the hardware impact on the aircraft. Recommendations for additional studies to use voice in the F-14 and other future naval aircraft were made as well as for investigations into related areas such as crew perception and discrimination of a computer generated voice. The goals of a prior study were to determine if synthetic voice messages would reduce the F-14 aircraft pilot's workload, increase his effectiveness during the mission, and to establish the hardware impact on the aircraft. Recommendations for additional studies to use voice in the F-14 and other future naval aircraft were made as well as for investigations into related areas such as crew perception and discrimination of a computer generated voice. Some pertinent questions arising from the F-14 study concerned: the distinctiveness and intelligibility of a computer generated synthetic voice in the aircraft hearing situation; whether or not the pilot can separate radio-transmitted human voice messages of interest from simultaneously generated synthetic voice messages; and the optimum method of presenting such messages through the headset. An exploratory study was designed to investigate these questions. The intent was to examine differing methodologies in presenting the stimuli used, and to ascertain trends in the subjects performance data. GRA

N83-13339*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INPUT IMPEDANCE TO PROBE FED MICROSTRIP ANTENNAS OVER ELECTRICALLY THICK SUBSTRATES Final Report
Jayanti Venkataraman, David C. Chang (Colorado Univ., Boulder), Keith R. Carver, and Bruce A. Blevins 8 Jun. 1982 44 p refs
Prepared in cooperation with New Mexico State Univ., Las Cruces
(Contract DAAG29-81-K-0112)
(NASA-CR-169548; NAS 1.26:169548; AD-A119035; NMSU/PSL-PI01001; ARO-15384.3-EL; ARO-18448.1-EL) Avail: NTIS HC A03/MF A01 CSCL 09/5

A general theory has been developed for the analysis of the input impedance to probe fed microstrip patch antennas where the entire spectrum of plane waves emanating from the exciting probe and an angularly dependent wall reflection coefficient has been incorporated. The primary emphasis is toward millimeter wavelength microstrip patch antennas where the substrate is electrically thick and requires the consideration of the dispersive effects of the dielectric. The expressions derived here for the input impedance are for a given probe location, size, and patch dimensions. The theory has no perceivable limitations with respect to substrate thickness or patch dimensions. Numerical results have been presented and compared with those obtained by the cavity model. A discussion of these results points out the primary feature of the present theoretical models, in that the wall susceptance being dynamic in nature, the expression obtained for input impedance is more appropriate for millimeter microstrip antennas. Comparison of this theory to experiment shows that this theory properly incorporates high frequency effects on the open end susceptance of a microstrip patch antenna. GRA

N83-13340# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
FINITE PLANE AND ANTI-PLANE ELASTOSTATIC FIELDS WITH DISCONTINUOUS DEFORMATION GRADIENTS NEAR THE TIP OF A CRACK
Graeme Francis Fowler Jul. 1982 88 p refs
(Contract N00014-75-C-0196)
(AD-A119029; TR-9) Avail: NTIS HC A05/MF A01 CSCL 12/1

In this paper the fully nonlinear theory of finite deformations of an elastic solid is used to study the elastostatic field near the tip of a crack. The special elastic materials considered are such that the differential equations governing the equilibrium fields may

lose ellipticity in the presence of sufficiently severe strains. The first problem considered involves finite anti-plane shear (Mode III) deformations of a cracked incompressible solid. The analysis is based on a direct asymptotic method, in contrast to earlier approaches which have depended on hodograph procedures. The second problem treated is that of plane strain of a compressible solid containing a crack under tensile (Mode I) loading conditions. The material is characterized by the so-called Blatz-Ko elastic potential. Again, the analysis involves only direct local considerations. For both the Mode III and Mode I problems, the loss of equilibrium ellipticity results in the appearance of curves ('elastostatic shocks') issuing from the crack-tip across which displacement gradients and stresses are discontinuous. Author (GRA)

N83-13341# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
THE CONFIGURABLE, HIGHLY PARALLEL (CHIP) APPROACH FOR SIGNAL PROCESSING APPLICATIONS Interim Report
Lawrence Snyder May 1982 20 p refs Presented in the Proc. of Tech. Symp. East, 1982
(Contracts N00014-80-K-0816; N00014-81-K-0360)
(AD-A119116; CSD-TR-402) Avail: NTIS HC A02/MF A01 CSCL 09/5

A VLSI design methodology, built around the CHiP architecture, is described. The switch lattice of the CHiP architecture is the primary design abstraction. The lattice is a flexible design medium with constraints that mirror those of raw silicon. An eight point pipelined Fast Fourier Transform design, used as a running example, is of independent interest for its locally connected layout. Author (GRA)

N83-13342# Pittsburgh Univ.,
NEAR-FIELD THEORY AND TECHNIQUES FOR WIDEBAND RADIATING SYSTEMS AT IN-BAND AND OUT-OF-BAND FREQUENCIES Final Technical Report, 14 Jul. 1978 - 14 Jan. 1982
B. J. Cown and C. E. Ryan, Jr. Research Triangle Park, N.C. Army Research Office Mar. 1982 162 p refs
(Contract DAAG29-78-C-0029)
(AD-A118956; ARO-15646.6-EL) Avail: NTIS HC A08/MF A01 CSCL 20/14

Theoretical and numerical analyses were performed to study the application of near-field theory and techniques to characterize the radiation and coupling characteristics of wideband, in-band and out-of-band pulsed or cw radiating systems. Specifically, theory and equations were developed for characterizing the radiation patterns of wideband cw or pulsed antennas over both in-band and out-of-band frequency intervals from measured data collected via near-field measurement techniques. The results are applicable to either phased array or reflector antennas. Three analytical techniques for analyzing the in-band and out-of-band coupling between pairs of cosited antennas were studied. The three techniques are (1) the Plane Wave Spectrum (PWS), (2) the Spherical Wave Spectrum (SWS), and Geometrical Theory of Diffraction (GTD). The existing theory and equations that are applicable to selected common waveguide components under normal in-band operation were extended to describe wideband out-of-band responses. Also, the theory and equations were formulated for computing the higher-order mode coefficients at the aperture of a waveguide radiating element from a knowledge of the measured far-field electric field of the radiating element when surrounded by a large conducting ground plane. GRA

N83-13343# Army Engineer Topographic Labs., Fort Belvoir, Va.
INVERSE SCATTERING APPLICATIONS IN DETERMINING TERRAIN FEATURE PARAMETERS Technical Report, Jan. - Jun. 1980
Richard A. Hevenor Dec. 1981 48 p
(DA Proj. 4A1-61101-A-91-D)
(AD-A119258; ETL-0279) Avail: NTIS HC A03/MF A01 CSCL 20/14

In this report, the results are described of an initial in-house research effort to investigate inverse scattering methods to determine terrain feature parameters. The problem of inverse scattering from discrete objects was considered, but was found not to apply to terrain feature extraction. Profile inversion concepts were analyzed, but were found to be only slightly relevant. Two specific inverse problems were analyzed and solved. The first problem involved solving for the dielectric constant of a slightly rough surface using the radar backscatter coefficients for two orthogonal polarizations. The second problem consisted of determining the dielectric constant and the conductivity of a medium located beneath a forest or jungle canopy. In this case, the electrical properties were calculated for two different polarizations of the incident wave. Author (GRA)

N83-13344# Honeywell Systems and Research Center, Minneapolis, Minn.
APPLICATION OF ADVANCED SPEECH TECHNOLOGY IN MANNED PENETRATION BOMBERS Final Draft Report, Aug. 1980 - Sep. 1981
R. North and W. Lea Wright-Patterson AFB, Ohio AFWAL Mar. 1982 171 p refs
(Contract F33615-80-C-3606; AF Proj. 2403)
(AD-A119274; Rept-81SRC57; AFWAL-TR-82-3004) Avail: NTIS HC A08/MF A01 CSCL 17/2

This report documents research on the potential use of speech technology in a manned penetration bomber aircraft (B-52/G and H). The objectives of the project were to analyze the pilot/copilot crewstation tasks over a three-hour-and forty-minute mission and determine the tasks that would benefit the most from conversion to speech recognition/generation, determine the technological feasibility of each of the identified tasks, and prioritize these tasks based on these criteria. Secondary objectives of the program were to enunciate research strategies in the application of speech technologies in airborne environments, and develop guidelines for briefing user commands on the potential of using speech technologies in the cockpit. The results of this study indicated that for the B-52 crewmember, speech recognition would be most beneficial for retrieving chart and procedural data that is contained in the flight manuals. Technological feasibility of these tasks indicated that the checklist and procedural retrieval tasks would be highly feasible for a speech recognition system. GRA

N83-13345# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
MILLIMETER WAVE PROPAGATION IN SURFACE VICINITY
Wolf-D. Schuck and Juergen Detlefsen (Tech. Univ., Munich) 1982 8 p refs Presented at AGARD Symp. on Propagation Effects of ECH-Resistant Systems in Commun. and Navigation, Copenhagen, 29-28 May, 1982
(MBB-UA-601/81) Avail: Issuing Activity

Propagation effects under various near-surface conditions were determined. Results relate to short range surface to surface missile guidance, e.g., high speed antitank guided weapons for which mechanical links like wire or optical fiber cannot be used, where the application of millimeter waves is advantageous compared to the restricted performance of laser links in a battlefield environment. Measurements were made in the 35 GHz frequency band. The results were compared to theoretical models. Results for surfaces like asphalt, water, gravel, and grass are given.
Author (ESA)

N83-13346# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
SATELLITE COMMUNICATION AND TELEVISION [SATELLITEN-KOMMUNIKATION UND DIREKTFERNSEHEN]
D. E. Koelle 1 Jun. 1982 67 p In GERMAN Presented at Sem. fuer Journaliskirweikrlbildung, Vienna, 1 Oct. 1981
(MBB-ur-550/81) Avail: Issuing Activity

The development of specialized satellites and the services which this equipment makes available are surveyed. Communication satellite systems, such as Intelsat, ECS, and TDRSS, are covered. Present and future satellite services are listed. Development of INTELSAT services is stressed. European communication satellites are described. Satellite development trends are pointed

out. Satellite subsystem technology is treated. The tradeoff between lifetime, ruggedness, and cost is evaluated. Geostationary platforms are considered. The fundamentals of satellite television are layed out. The TV-SAT/TDF1 project is outlined. Future developments in European satellite television are mentioned. Author (ESA)

N83-13347# ERA Ltd., Leatherhead (England).
EMC STUDIES OF THE ERS-1, INITIAL EVALUATION Final Report
R. J. Chignell, G. A. Jackson, and A. Mchale Paris ESA May 1982 116 p refs
(Contract ESA-4998/82/DD(SC))
(ERA-82-24; ESA-CR(P)-1619) Avail: NTIS HC A06/MF A01

An EMC design philosophy and procedures for RF EMC system qualification of ERS-1 are presented. Particular EMC problems arise because of the two high power radars in its payload, which are mounted adjacent to sensitive receivers. Mutual coupling between antennas is a major potential source of incompatibility. It is shown that the achievement of EMC in the flight model can only be assured if potential sources of incompatibility are identified at an early stage and remedial action is initiated. For this the emissions and susceptibilities of all the subsystems are required, together with their mutual transfer functions. An EMC data bank that can be dynamically updated as more experimental data becomes available is advocated. Author (ESA)

N83-13348# Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
EXPERIMENTAL SPHERICAL NEAR FIELD ANTENNA TEST FACILITY, PHASE 2. VOLUME 1: FACILITY DESCRIPTION AND MEASUREMENT RESULTS Final Report
Erik Lintz Christensen, Jesper E. Hansen, Claus Kjaergaard Hansen, Sven Bjoern Hansen, Flemming Holm Larsen, and G. H. Lemanczyk Paris ESA Dec. 1981 185 p refs 2 Vol.
(Contract ESA-3916/79/NL-DG)
(R-248; ESA-CR(P)-1636-Vol-1) Avail: NTIS HC A09/MF A01

An experimental facility for spacecraft antennas was developed. An HP1000 minicomputer controls the measurements and performs the near field to far field transformations. Measurements were carried out on an OTS spotbeam reflector antenna and a MARECS circularly polarized horn to qualify the technique. The results indicate that directivity can be predicted to within 0.04 dB. On-axis cross polarization and sidelobe levels are also accurately measured. Measurement of cross polar level is least accurate. Author (ESA)

N83-13349# TICRA ApS, Copenhagen (Denmark).
EXPERIMENTAL SPHERICAL NEAR FIELD ANTENNA TEST FACILITY, PHASE 2. VOLUME 2: ACCURACY REQUIREMENTS EVALUATED FROM NUMERICAL SIMULATIONS Final Report
Frank Jensen Paris ESA 9 Oct. 1981 141 p refs 2 Vol.
(Contract ESA-3916/79/NL-DG)
(S-113-03; ESA-CR(P)-1636-Vol-2) Avail: NTIS HC A07/MF A01

The performance of a spacecraft antenna test facility was simulated by numerical modeling of near field measurements. The result for a test antenna with 38 dB directivity can be predicted within 0.04 dB, the sidelobe level at -27 dB within 1.0 dB, and the level of the cross polarized lobe at -48 dB within 2 dB, when multiple reflections are avoided. A linear relationship between the various measurement inaccuracies and the consequential inaccuracies in the predicted far field are shown. Author (ESA)

N83-13350# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
RADAR DOPPLER DETECTION METHODS WITH APPLICATIONS TO CODAR
Patricia A. Miller and James A. Leise Mar. 1982 30 p refs
(PB82-230442; NOAA-TM-ERL-WPL-94; NOAA-82052412) Avail: NTIS HC A03/MF A01 CSCL 17I

The usefulness of Doppler spectra data depends on how well signals can be separated from noise. Methods are presented (along with FORTRAN subroutines) to detect a signal consisting of two 'spikes' in the spectrum. The methods are analyzed and tested on CODAR (Coastal Ocean Dynamics Applications Radar) data with good results. GRA

N83-13351# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
A GUIDE TO THE USE OF THE ITS IRREGULAR TERRAIN MODEL IN THE AREA PREDICTION MODE
George A. Hufford, Anita G. Longley, and William A. Kissick Apr. 1982 124 p refs
(PB82-217977; NTIA/Rept-82-100) Avail: NTIS HC A06/MF A01 CSCL 17B

The Institute for Telecommunication Sciences (ITS) model of radio propagation for frequencies between 20 MHz and 20 GHz (the Longley-Rice model) is a general purpose model that can be applied to a large variety of engineering problems. The model, which is based on electromagnetic theory and on statistical analyses of both terrain features and radio measurements, predicts the median attenuation of a radio signal as a function of distance and the variability of the signal in time and in space. The model is described in the form used to make area predictions for such applications as preliminary estimates for system design, military tactical situations and surveillance, and land mobile systems. This guide describes the basis of the model, its implementation, and some advantages and limitations of its use. Sample problems are included to demonstrate applications of the model. GRA

N83-13352# Middleton (David), New York.
THRESHOLD SIGNAL RECEPTION IN ELECTROMAGNETIC INTERFERENCE ENVIRONMENTS: PART 2. RECEIVER STRUCTURES AND PERFORMANCE FOR CLASS A EMI ENVIRONMENTS AND SCENARIOS
David Middleton Mar. 1982 137 p refs
(PB82-226846; NTIA/CR-82/17) Avail: NTIS HC A07/MF A01 CSCL 17B

The specific problems of determining minimum detectable signals and maximum detection ranges for telecommunication receivers operating in highly non-Gaussian electromagnetic interference (EM) environments are examined in detail. Various characteristic models of Class A interference are developed, along with their EMI scenarios (namely, source distributions, propagation law, waveform structures, and statistics). These are needed, in turn, to establish the analytical and quantitative forms of the optimum signal processing algorithms, particularly in the limiting threshold (weak signal) cases considered here. Various modes of detection are employed: optimum (threshold) coherent and incoherent reception, and the important suboptimum coherent case of cross correlation detection (well known to be optimum for Gaussian noise). GRA

N83-13353# Middleton (David), New York.
PERFORMANCE OF TELECOMMUNICATIONS SYSTEMS IN THE SPECTRAL-USE ENVIRONMENT. PART 7: INTERFERENCE SCENARIOS AND THE CANONICAL AND QUASI-CANONICAL (FIRST-ORDER) PROBABILITY MODELS OF CLASS A INTERFERENCE
David Middleton Mar. 1982 148 p refs
(Contract HO-A01-78-00-1158)
(PB82-226861; NTIA/CR-82/18) Avail: NTIS HC A07/MF A01 CSCL 17B

Work on Class A electromagnetic interference (EMI) models is further developed and extended to include approximately-canonical and quasi-canonical cases, in addition to the earlier, strictly-canonical forms. The necessity for an extension was shown by computer simulation of Class A interference. Author (GRA)

N83-13354# Purdue Univ., Lafayette, Ind. Lab. for Applied Industrial Control.
A PULSE CODE MODULATED ANALOG AND DIGITAL COMMUNICATIONS PROTOTYPE Final Technical Report
John K. Marshall and Frederic J. Mowle Apr. 1982 145 p refs
(Contract MA79-SAC-00101)
(PB82-227828; PLAIC-125; MA-RD-930-82059) Avail: NTIS

HC A07/MF A01 CSCL 17B

The prototype of a fiber optics based communications system for ships which should provide an extremely reliable medium for voice and analog and digital data even under severe ship's casually conditions is discussed. The system works on the principle of a redundant fiber optic ring cable with the redundant cable elements laid in a different path throughout the ship. Each compartment has a device connected to each redundant cable element thus assuring communications from each compartment even under the most extreme emergencies. GRA

N83-13355# Purdue Univ., Lafayette, Ind. Lab. for Applied Industrial Control.

RELIABILITY IN A MICROCOMPUTER CONTROLLED OPTICAL FIBER COMMUNICATIONS NETWORK Interim Report

Yao-Nan Lien and Frederic J. Mowle Apr. 1982 52 p refs

(Contract MA79-SAC-00101)

(PB82-227836; PLAIC-123; MA-RD-930-82060) Avail: NTIS HC A04/MF A01 CSCL 17B

Reliability in communications networks is discussed. Included is a review of failure types, methods of failure detection and techniques for recovery from failures of all types including both hardware and software methods. Methods are described for assuring extremely high availabilities for communications systems. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-13356 New Jersey Inst. of Tech., Newark.

REMOTE ATTITUDE MEASUREMENT TECNIQUES Ph.D. Thesis

John Frank Elmer et al 1982 184 p

Avail: Univ. Microfilms Order No. DA8222735

A probabilistic approach is developed to treat practical problems in physical geometry where the necessary data are measured by separated sensors. Remote measurement of the attitude of these sensor's own local coordinate system into its equivalent description in a common coordinate system. A technique is presented to determine the relative attitude of remotely located sensors based upon each sensor measuring the same set of two physical vectors. Sensors measure physical vectors in terms of probabilistic vectors. The attitude of the sensor is expressed in terms of a probabilitic matrix. The engineering considerations for implementing a remote attitude measurement, ReAtMent, system are presented including the development of an error budget necessary to insure that the ReAtMent system performs to the required accuracy. An experimental section is presented using an electro-optical sensor whose attitude is measured in terms of a probabilistic matrix. Dissert. Abstr.

N83-13357 Cornell Univ., Ithaca, N. Y.

A RESISTANCE MEASUREMENT OF THE DIFFUSION AND ELECTROTRANSPORT OF HYDROGEN AND DEUTERIUM IN VANADIUM-BASED ALLOYS Ph.D. Thesis

David James Pine 1982 157 p

Avail: Univ. Microfilms Order No. DA8219364

The diffusion coefficient D and electrotransport effective charge Z of hydrogen and deuterium were measured as a function of temperature in pure vanadium and in vanadium-titanium and vanadium-chromium alloys. The diffusion coefficient was measured using a resistance technique. Diffusion is along the length of a foil which was loaded electrolytically to a hydrogen concentration of approximately 0.5 atomic per cent. Initially the hydrogen is held at uniform concentration in essentially half the length of the foil by the effect of a DC electrotransport current of 2500 A/sq cm in the other half. After this current is removed, the diffusion of H into the empty half is monitored by its effect on the resistivity of the foil. The sensitivity to hydrogen concentration is + or - 10 ppm. Dissert. Abstr.

N83-13358 Clarkson Coll. of Technology, Potsdam, N.Y.

THE ELECTRICAL RESISTIVITY OF COMPOSITE MATERIALS Ph.D. Thesis

Timothy Allan Jenkins 1982 360 p refs

Avail: Univ. Microfilms Order No. DA8219886

The electrical resistivity of an artificial fibrous composite material (6061 aluminum-Thornel 50) and of several directionally solidified eutectic alloys [Al-Al3Ni, Al-Al6Fe, Al-Al9Co2, Ni-Ni3Nb, Ni(Cr)/Ni3Al-Ni3Nb, Ni-Ni3Al-Mo, (Co, Cr, Ni)-(Co, Cr, Ni)7C3, and (Co, Cr, Fe)-(Co, Cr, Fe)7C3] was studied as a function of temperature between 77 and 300 K. The theories for the longitudinal and transverse resistivities of the composites in terms of the components were derived, and these inverted for the binary case to obtain the resistivities of the components in terms of the measured longitudinal and transverse resisitivities. This gives good results for the resistivity of the matrix, but the resistivity of the dispersed phase is extremely sensitive to experimental error. It is found that interface effects play a very important role in the composite resistivities. Dissert. Abstr.

N83-13359*# Pittsburgh Univ.,

LOSSES IN CHOPPER-CONTROLLED DC SERIES MOTORS Final Report

Howard B. Hamilton Apr. 1982 127 p refs

(Grant NsG-3163; Contract DE-AI01-77CS-51044)

(NASA-CR-167845; DOE/NASA-3163-1; NAS 1.26:167845) Avail: NTIS HC A07/MF A01 CSCL 09C

Motors for electric vehicle (EV) applications must have different features than dc motors designed for industrial applications. The EV motor application is characterized by the following requirements: (1) the need for highest possible efficiency from light load to overload, for maximum EV range, (2) large short time overload capability (The ratio of peak to average power varies from 5/1 in heavy city traffic to 3/1 in suburban driving situations) and (3) operation from power supply voltage levels of 84 to 144 volts (probably 120 volts maximum). A test facility utilizing a dc generator as a substitute for a battery pack was designed and utilized. Criteria for the design of such a facility are presented. Two motors, differing in design detail, commercially available for EV use were tested. Losses measured are discussed, as are waves forms and their harmonic content, the measurements of resistance and inductance, EV motor/chopper application criteria, and motor design considerations. S.L.

N83-13360*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INTEGRATED PHOTO-RESPONSIVE METAL OXIDE SEMICONDUCTOR CIRCUIT Patent Application

Murzban D. Jhabvala, David Dargo, and John C. Lyons, inventors (to NASA) Filed 16 Jul. 1982 15 p

(NASA-Case-GSC-12782-1; US-Patent-Appl-SN-399074) Avail: NTIS HC A02/MF A01 CSCL 09A

An infrared photoresponsive element (RD) is monolithically integrated into a source follower circuit of a metal oxide semiconductor device by depositing a layer of a lead chalcogenide as a photoresistive element forming an ohmic bridge between two metallization strips serving as electrodes of the circuit. Voltage from the circuit varies in response to illumination of the layer by infrared radiation. NASA

N83-13361# Raytheon Co., Bedford, Mass. Missile Systems Div.

HIGH-SPEED MICRO SIGNAL PROCESSOR Final Report, 5 Dec. 1977 - 30 Dec. 1981

George Agule Wright-Patterson AFB, Ohio AFWAL Jun. 1982 242 p

(Contract F33615-77-C-1224; AF Proj. 6906)

(AD-A119113; BR-13111; AFWAL-TR-82-1071) Avail: NTIS HC A11/MF A01 CSCL 09/1

This report covers hardware and software test results of CMOS/SOS LSI chips and a demonstration unit performing a selected set of signal processing algorithms. Chip specifications and system design descriptions are included. Author (GRA)

N83-13362# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
TWO-DIMENSIONAL NUMERICAL SIMULATION OF SEMICONDUCTOR DEVICES Ph.D. Thesis
Craig H. Price May 1982 163 p refs
(AD-A119110; AFIT/CI-NR-82-24D) Avail: NTIS HC A08/MF A01 CSCL 09/1

Two-dimensional numerical simulation is a necessary tool for modern semiconductor device design. Analytical models and judicious application of one-dimensional simulation cannot accurately represent the highly two-dimensional impurity profiles and structures of VLSI devices. Moreover, the allowable device structures and bias conditions of existing two-dimensional simulation programs are too restrictive to provide the necessary design information. A two-dimensional numerical simulation program, PISCES, has been written in order to study various aspects of device simulation. The program uses vectorized LU decomposition to alternately solve Poisson's equation and the electron current continuity equation (Gummels method). The program is extremely flexible and useful in evaluating two-dimensional simulation concerns such as grid allocation, boundary conditions, convergence characteristics and physical models. Author (GRA)

N83-13363# Army Engineer Topographic Labs., Fort Belvoir, Va.
A SENSING ARRAY SYSTEM WITH IMAGE STATISTICS PROCESSING
Pi-Fuay Chen May 1982 28 p refs
(DA Proj. 4A1-61102-B-52-C)
(AD-A119259; ETL-0297) Avail: NTIS HC A03/MF A01 CSCL 09/2

An image domain processing technique was implemented with a solid-state sensor array minicomputer system. The solid-state array converted the photographic images into electronic signals that were used by the minicomputer to evaluate image histogram and image texture. A computer-controlled translational stage served as the image holder. A 16-dimensional feature vector was computed for each input image based on the image histogram and image texture methods developed. Two types of classifiers, a sequential template-matching classifier and a minimum-distance classifier, were designed using only four components of the feature vector. Classification accuracy of better than 90 percent was obtained for both classifiers for a selected set of photographic imagery. Author (GRA)

N83-13364# Hughes Aircraft Co., Fullerton, Calif. Engineering Services and Support Div.
RADC TESTABILITY NOTEBOOK Final Technical Report, Jan. 1980 - Apr. 1981
J. Byron, L. Deight, and G. Stratton Griffiss AFB, N.Y. RADC Jun. 1982 375 p refs
(Contract F30602-80-C-0058; AF Proj. 2338)
(AD-A118881; RADC-TR-82-189) Avail: NTIS HC A16/MF A01 CSCL 14/2

Testability represents the inherent susceptibility of electronics systems to undergo valid functional performance testing, fault detection and fault isolation, together with the characteristics of the test system mix of Built-in-Test and external test equipments. A high degree of testability is necessary to achieve the highest levels of system performance and availability at least costs of system development and operation since good testability allows for discovery and correction of faulty system operation with the least expenditure of program resources and within acceptable limits of elapsed time. The inherent testability needs to be systematically developed and integrated with the design of the system and the requirements for testability must be accorded the same level of recognition as performance, reliability, maintainability, availability, supportability, and safety. The Testability Notebook provides fundamental guidance for systematic establishment throughout the development cycle of the requisite inherent testability and comprehensive testability of the test resource mix in combination with the prime system design. Author (GRA)

N83-13365# Pennsylvania Univ., Philadelphia.
RESEARCH ON FAULT ANALYSIS OF ANALOG CIRCUITS Final Report, Mar. 1975 - Jun 1982
Samuel D. Bedrosian Jul. 1982 24 p refs
(Contract N00014-75-C-0768)
(AD-A118878) Avail: NTIS HC A02/MF A01 CSCL 09/5

To attack the long standing fault isolation problem in analog electronic circuits, we have focused on two of the major problems. One is the presence of uncertainties such as indeterminancy, vagueness, randomness, and so on that naturally arise during the solution procedure of analog fault isolation. The other is the presence of topological restrictions inherent in specific circuit configurations. Our main attention was focused on dealing with the fault isolation problem involving various kinds of uncertainties such as indeterminancy or vagueness. We show that such problems lend themselves very well to and in fact can be solved by adopting fuzzy set concepts. In particular, this line of research has produced a modified fuzzy set technique applicable to automatic fault isolation. Topological aspects utilizing graph theory may be used effectively to assist in preanalysis of faulty analog electronic circuits. As a spinoff of a consideration of these problems, we developed some new theorems for element value solvability. It should be made clear, however, that effective fault isolation can be accomplished with or without this preanalysis to assist in resolving the more fundamental problem incurred by uncertainty. GRA

N83-13366# CTI-Cryogenics, Inc., Waltham, Mass.
CLOSED CYCLE CRYOCOOLER FOR LOW TEMPERATURE ELECTRONIC CIRCUITS. PHASE 2: PRELIMINARY DESIGN Final Report, 15 May - 30 Sep. 1981
F. William Pirtle Aug. 1982 80 p
(Contract N00014-81-C-0525)
(AD-A119356) Avail: NTIS HC A05/MF A01 CSCL 13/1

This study program was conducted under Office of Naval research contract N00014-81-C-0525 to develop a preliminary design of a small, low power, very low magnetic signature, lightweight, efficient closed cycle cryocooler suitable for use with superconductive and other low temperature electronics circuits. The preliminary design is directly based on the results of the Phase I concept study (contract N00014-80-C-0465). GRA

N83-13367# Naval Postgraduate School, Monterey, Calif.
DESIGN AND OPERATION OF A SIMPLE CIRCUIT USEFUL AS A MODULATOR TO GENERATE ARBITRARY COMPOSITE ASK AND PSK CARRIERS M.S. Thesis
Allan M. Maughan Jun. 1982 108 p refs
(AD-A119345) Avail: NTIS HC A06/MF A01 CSCL 09/5

In radio transmission of binary data, it is often desirable to conserve bandwidth at the expense of signal power. To reduce carrier bandwidth (switching rate), M bits are used to change a parameter of the carrier, so the carrier has 2M discrete combinations of amplitude, frequency, or phase. GRA

N83-13368# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
DISCHARGE MODES AT THE ANODE OF A VACUUM ARC
H. C. Miller 4 Aug. 1982 20 p refs
(Contract DE-AC04-76DP-00656)
(DE82-018147; GEPP-TIS-659) Avail: NTIS HC A02/MF A01

The two most common anode modes in a vacuum arc which are the low current mode, where the anode is basically inert and the high current mode with a fully developed anode spot are discussed. This anode spot is very bright, has a temperature near the boiling point of the anode material, and is a copious source of vapor and energetic ions. Other anode modes, however do exist. A low current vacuum arc with electrodes of readily sputterable material will emit a flux of sputtered atoms from the

anode and an intermediate current and anode footpoint can form. This footpoint is luminous, but much cooler than a true anode spot. A high current mode exists where several small anode spots are present instead of a single large anode spot. DOE

N83-13369# General Electric Co., Pittsfield, Mass. Large Power Transformer Dept.
BASIC TRANSFORMER-LIFE CHARACTERISTICS. VOLUME 1: OVERLOAD CHARACTERISTICS AND LIFE-TEST EVALUATION Final Report
G. H. Kaufmann Jun. 1982 172 p refs Sponsored by EPRI 2 Vol.
(EPRI Proj. 1289-1)
(DE82-905850; EPRI-EL-2443-Vol-1) Avail: NTIS HC A08/MF A01

The results of experimental studies related to transformer survivability are described. It deals with the behavior of typical power transformer insulation systems during short-time exposure to elevated temperatures, and it provides some insight into failure mechanisms associated with gas bubble evolution within the insulation structure. Another important phase of the program involved the development and exploratory evaluation of a functional test program which may be used for determining the life expectancy characteristics of power transformers. Still another investigation resulted in the development and evaluation of an overload test procedure for power transformers. A feasibility study on a new type of thermal sensor for possible use as a winding hot spot sensor yielded promising results. The data presented is expected to be of help in developing improved transformer operating practices and in permitting an assessment of failure risks associated with particular service conditions. Author

N83-13370# General Electric Co., Pittsfield, Mass. Large Power Transformer Dept.
BASIC TRANSFORMER-LIFE CHARACTERISTICS. VOLUME 2: EVALUATION OF A FLUOROPTIC SUP TM THERMOMETER AS A HOT-SPOT SENSOR FOR POWER TRANSFORMERS Final Report
G. H. Kaufmann Jun. 1982 36 p refs Prepared in cooperation with Luxtron Corp. Sponsored by EPRI 2 Vol.
(EPRI Proj. 1289-1)
(DE82-906448; EPRI-EL-2443-Vol-2) Avail: NTIS HC A03/MF A01

The utility industry has long expressed the need for temperature instrumentation capable of monitoring the hottest spot of a transformer winding in service. The Fluoroptic temperature sensor concept developed by Luxtron Corporation is evaluated. The sensing element consists of an optical fiber with a temperature sensitive tip made of a rare earth phosphor. The excellent dielectric properties of probe materials, and the results of short-time survival studies on measuring probes and accessories in a simulated transformer environment tend to confirm that this technology may be suitable for transformer service. Specific design and material problems which must be resolved before a viable system can be developed are identified in the report. DOE

N83-13371# Power Technologies, Inc., Schenectady, N. Y.
EVALUATION OF A GLASS INSULATED CABLE SYSTEM
Apr. 1982 328 p refs
(Contract DE-AC01-76ET-29047)
(DE82-019120; DOE/ET-29047/1) Avail: NTIS HC A15/MF A01

A cable system for underground power transmission at 230 to 345 kV was developed. This cable has the copper conductor bundles encased in glass tubes. Gas passes through the interior of the glass tubes to cool the conductors. Pressurized water cools the outside of glass tube clusters. The whole assembly is encased in a 10 in. OD coated steel pipe. This evaluation program was undertaken to determine the loss and breakdown characteristics of the borosilicate glass used for the cable tubes, to optimize methods for sealing tubing lengths, and to evaluate methods for fabricating and installing the cable tubing. The testing procedures are described. The results showed that the glass has good high-temperature electrical properties with especially high dc resistivity, but that the tubing seals were unacceptable electrically. It was concluded that the system as presently envisioned is not suitable as an underground cable because of the poor electrical performance of glass seals. The glass may have other applications such as entrance bushings to high-temperature test chambers. DOE

N83-13372# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Electrical Machinery.
SOME METHODS TO CONNECT A WINDPOWER INDUCTION GENERATOR TO THE UTILITY NETWORK
O. Carlsson and J. Hylander Apr. 1981 6 p refs
(DE82-750057; NE/VIND-81/4) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

When an induction generator is switched on to a grid, heavy inrush currents may appear, which may result in a transient voltage variation. By using inductors or thyristors in series with the generator, or capacitor excitation before synchronizing it, the inrush currents could be limited to acceptable levels. DOE

N83-13373# McGraw-Edison Co., Franksville, Wis.
DEVELOPMENT OF A DISTRIBUTION TRANSFORMER NOT SUBJECT TO DESTRUCTIVE FAILURE Final Report
T. O. Sokoly, J. M. Ghinazzi, J. F. Baranowski, and G. L. Goedde Jul. 1982 95 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 1143-1)
(DE82-905814; EPRI-EL-2484) Avail: NTIS HC A05/MF A01

The substitution of inorganic high temperature insulations for the oil-paper system in present transformer designs was studied. Various types of ceramic, glass, and other inorganic materials were studied. Processing techniques necessary to apply these materials to a transfer were developed. A variety of design configurations for the transformer were studied, with emphasis on developing processing methods needed for the use of presently available materials. DOE

N83-13374# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF INTEGRATED THERMIONIC CIRCUITS FOR HIGH-TEMPERATURE APPLICATIONS
J. Byron McCormick, Dale Wilde, Stephen Depp (IBM, San Jose), Douglas J. Hamilton (Ariz. Univ.), and William Kerwin (Ariz. Univ.) 1981 11 p ref Presented at the IEEE High Temp. Electron. and Instrumentation Conf., Houston, Tex., 7-8 Dec. 1981
(Contract W-7405-eng-36)
(DE82-004339; LA-UR-81-3300; CONF-811213-3) Avail: NTIS HC A02/MF A01

A class of microminiature, thin film devices known as integrated thermionic circuits (ITC) capable of extended operation in ambient temperatures up to 500 C is described. The evolution of the ITC concept is discussed. A set of practical design and performance equations is demonstrated. Recent experimental results are discussed in which both devices and simple circuits have successfully operated in 500 C environments for extended periods of time (greater than 11,000 hours). DOE

N83-13375# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
SHORT TERM ADAPTIVE PREDICTION OF RAILWAY POWER DEMAND
J. D. vanderBij (Tech. Hogeschool, Eindhoven, Netherlands) and J. H. vanSchuppen Dec. 1981 28 p refs Submitted for publication
(MC-BW-153/81) Avail: NTIS HC A03/MF A01

The short-term prediction probiem is considered for power demand at railway energy supply stations of the Dutch national railway company. A model and an adaptive prediction algorithm are presented. The algorithm is based on a selftuning predictor for the output of a Gaussian system. Author (ESA)

N83-13376# Rolls-Royce Ltd., Derby (England).
INSULATION RESISTANCE OF MINERAL-INSULATED CABLES
Ottmar Gerlach 6 Jan. 1982 10 p refs Transl. into ENGLISH from Messen und Prufen/Autom. (West Germany), p 584-587

(PNR-90132; Trans-16000; TLT-00854) Avail: NTIS HC A02/MF A01

The insulation characteristics of Al2O3, and MgO insulated cables are summarized. The insulation resistance of MgO insulated cables normally attains 5000 ohms/m at 1000 C, although values of up to 5000 ohms at 1000 C can be realised. The insulation resistance increases by a power of 10 per 100 K fall in temperature. The insulation resistance of Al2O3 insulated cables in the temperature range from 600 to 1000 C is 10 billion to 100 billion ohms/m. The addition of BN increases insulation resistance over small boundaries, but results vary widely between cables. The insulation resistance of cables whose insulating material is filled with argon, helium or nitrogen at 25 bar is improved by half a power of 10 at 1000 C. Author (ESA)

N83-13377# Rolls-Royce Ltd., Derby (England).
DESIGN OF ELECTRONIC COMPONENTS FOR COMBINED CONTROL SYSTEMS
B. Riha 1982 16 p refs Transl. into ENGLISH from Sbornik (Czechoslovakia), p 17-23
(PNR-90137; Trans-16025; TLT-00859) Avail: NTIS HC A02/MF A01

The design of electronic components with integrated circuits and printed connections for jet engine control is discussed. Subcomponent selection and testing, and ways of reducing unfavorable climatic effects, or other extraneous influences (e.g., electromagnetic fields) are covered. Choice of circuit board size for flat strip connections is considered. Component insertion and circuit board soldering are treated. An analog coupled central electronic component is described. Author (ESA)

N83-13378# Vereinigte Elektrizitaetswerke Westfalen A.G., Dortmund (West Germany). Hauptbereich Maschinentech.
BASIC ENGINEERING OF A 10 T/HR PROTOTYPE PLANT FOR THE VEREINIGTE ELEKTRIZITAETSWERKE WESTFALEN (VEW) COAL CONVERSION PROCESS Final Report, Nov. 1981
Klaus Weinzieri, Dietmar Deggim, Juergen Poller, and Robert Karger Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 111 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-114; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,50

A coal conversion process and prototype plants are described. The prototype plant consists of the gasification unit with coal milling and drying, the coal feeding, the waste heat recovery and gas/char separation unit and the gas cleaning unit with the gas cooling, the H2S removal, and the evaporation and sulfur production units. Author (ESA)

N83-13379# AEG-Telefunken, Heilbronn (West Germany). Elektricitaets Gesellschaft.
INTEGRATED COMPONENTS FOR THE OPTICAL ACQUISITION OF INFORMATION
Klaus Berchtold Jul. 1980 31 p refs Transl. into ENGLISH of mono. "Integrierte Bauelemente fuer die Optische Informationsefassung" West Germany, 1980
(PB82-238155; BMFT-FB-T-80-024) Avail: NTIS HC A03/MF A01 CSCL 09E

The groundwork for integrated circuit (IC) design of optical receivers is established. Monolithic integrated receivers of varying design complexity were developed. Bipolar opto-IC's realized include a photo threshold switch for exposure and illumination control with controlled hysteresis (minimum switch-on illuminance is approximately 1 lux) and a photo pulse amplifier for light barriers in industrial electronics. For high sensitivity opto-IC's Bi FET technology was employed. A temperature compensated dc light amplifier was monolithically integrated; minimum switch-on illuminance is 1 mulux. For fiber optic applications, a hybrid integrated wideband amplifier with a frequency limit of 100 MHz was also developed. Electrical characterization tests and measurements for all these devices show satisfactory performance. GRA

N83-13380# National Bureau of Standards, Washington, D.C. Semiconductor Materials and Processes Div.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: NBS/RADC WORKSHOP MOISTURE MEASUREMENT TECHNOLOGY FOR HERMETIC SEMICONDUCTOR DEVICES, 2 Final Report
Elaine C. Cohen, ed. and Stanley Ruthberg, ed. Apr. 1982 305 p refs Proceedings of workshop held in Gaithersburg, Md., 5-7 Nov. 1980 Sponsored in part by RADC
(PB82-217985; NBS-SP-400-72; LC-82-600503) Avail: NTIS HC A14/MF A01 CSCL 14B

The Workshop, one of a series concerned with measurement problems in integrated circuit processing and assembly, served as a forum to examine the progress made in the measurement and control of moisture in hermetically packaged semiconductor devices. Manuscripts are provided of 36 presentations which detail the progress made in mass spectrometer measurements and calibration of internal package moisture, in increased assurance with moisture sensors, in testing, and in package control. GRA

N83-13381# Valvo G.m.b.H.; Hamburg (West Germany). Roehren- und Halbleiterwerke.
METHODS OF FABRICATING INTEGRATED CIRCUITS FOR HIGH VOLTAGES Final Report
Ulrich Winkler 1979 30 p refs Transl. into ENGLISH from the mono. "Neue Verfahren zun Herstellung Integrieter Schaltungen fuer Hohe" West Germany In GERMAN; ENGLISH summary Original language document announced as 81N-33419 Sponsored by Bundesministerium fuer Forschung ung Technologie
(PB82-207382; BMFT-FB-T-80-187; ISSN-0340-7608) Avail: NTIS HC A03/MF A01 CSCL 09E

The production of bipolar integrated circuits with breakdown voltages of 200 to 250 volts is described. Particular attention is given to the following techniques: aluminum implantation with subsequent diffusion is used as a fast insulation method, the use of V grooves which are heavily doped with phosphorous to form low ohmic collector contacts, and the use of polycrystalline silicon doped with oxygen to produce a surface passivation layer which suppresses parasitic MOS channels. These techniques make possible the production of integrated circuits for video and stages for TV equipment, and regulation and control circuits in vehicles. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-13382 California Univ., San Diego.
OBSERVATIONS ON BUBBLE DYNAMICS AT HIGH PRESSURES AND BUBBLE DYNAMICS IN STAGNATION FLOW Final Report, 1 Sep. 1979 - 30 Sep. 1981
Albert T. Ellis and John E. Starrett 30 Nov. 1982 66 p refs Document also announced as A80-25030
(Contract N00014-79-C-0547; NR Proj. 062-283)
Copyright. Avail: Issuing Activity CSCL 20/4

Development of a ruby laser light source permitted moving pictures of bubble growth and collapse to be made during a two-millisecond observation time at rates from 100,000 to 1,000,000 frames per second with exposure time of approximately 2x10 to the -8th power seconds. The coherent nature of the laser illumination revealed shock waves without need for Schlieren techniques. It was evident that bubble collapse microjets rather than shockwaves caused greater damage to fused quartz specimens. There also seemed to be damaging jets generated during bubble rebound. Sine possible use of cavitation to assist deep bore earth drilling has been proposed, experiments were conducted utilizing spark generated cavities in water and non-Newtonian solutions at ambient pressures up to 35 MPa (10,000

ft bore-hole depth). To facilitate analysis, single bubbles were generated in a flow normally impacting a solid wall. The bubbles assumed an elliptical shape near the stagnation region and relatively fine bubble jets were observed during both collapse and rebound. The dynamic behavior of spark generated cavitation bubbles in an experimental stagnation flow was studied with high speed cine photography. M.G.

N83-13383 Princeton Univ., N. J.
AN EXPERIMENTAL INVESTIGATION OF THE NONLINEAR DISTURBANCE DEVELOPMENT IN BOUNDARY LAYER TRANSITION Ph.D. Thesis
David Robert Williams 1982 228 p
Avail: Univ. Microfilms Order No. DA8223287

An experimental investigation of the nonlinear disturbance development in boundary layer transition was conducted in a water channel. The initial laminar boundary layer developed over a flat plate without a pressure gradient. A disturbance was introduced by an oscillating wire, and its development was followed downstream with hot film anemometer measurements of the velocity components from the early nonlinear stage, u'r.m.s - .05 Uo to the early stages of the high shear layer breakdown. All three velocity components were measured in a three dimensional volume of grid points. Digital data analysis techniques were used to conditionally sample and ensemble average the velocity signals, in this way the entire instantaneous flow field could be reconstructed in terms of velocity vectors, vorticity contours and vorticity vectors at any desired instant in the cycle of the disturbance. This technique also allowed the velocity signals to be decomposed into their Fourier components to study the growth of the harmonics and the variations in the phase distributions. Dissert. Abstr.

N83-13384 Stanford Univ., Calif.
ON THE NUMERICAL COMPUTATION OF LAMINAR AND TURBULENT BOUNDARY LAYERS AT GAS-LIQUID INTERFACE Ph.D. Thesis
Stephen Paul Klotz 1982 219 p refs
Avail: Univ. Microfilms Order No. DA8220488

A finite difference scheme is developed for solving laminar and turbulent boundary layer problems which simulate two dimensional, steady state flows coupled across a density interface. The scheme is an extension of the differential mean flow procedure. Turbulent mixing in rough wall flows is discussed and a diffusion layer model is extended to include effects of roughness on momentum transport in boundary layers. Calculations of flows adjacent to rough, solid walls and an air water interface roughened by wind waves are compared to available data. Parameterization of the effective roughness of surface wave spectra is examined. Wave breaking and wave turbulent interactions are considered, and a simple length scale model is provided to simulate the augmented mixing observed in flows beneath laboratory wind waves. The computation of gas liquid flows by additional methods is discussed. An algorithm for obtaining self similar solutions to laminar boundary layer problems by Runge-Kutta integration is provided. The applicability of integral techniques to coupled flows is investigated and an analytic similarity solution for laminar problems with a plane, phase changing interfacial boundary is presented. Dissert. Abstr.

N83-13385 Minnesota Univ., Minneapolis.
THE FREE SURFACE ON A SIMPLE FLUID BETWEEN ECCENTRIC CYLINDERS ROTATING AT DIFFERENT SPEEDS Ph.D. Thesis
Aydeniz Siginer 1982 182 p
Avail: Univ. Microfilms Order No. DA8221330

The free surface flow of a simple fluid between eccentric cylinders is considered. Flow between rotating cylinders is reviewed. The rod climbing problem between eccentric cylinders is defined and set in a mathematical context. The analytical problem is solved using domain perturbations. At the 1st order a plane flow is obtained with an asymmetrical free surface. At the 2nd order the problem is reduced to three subproblems: (1) a plane Newtonian flow which collapses, as the eccentricity goes to zero, on to the axially symmetrical solution for the case of two concentric cylinders; (2) a top driven, three dimensional, Newtonian flow which tends to zero as the eccentricity tends to zero; and (3) a non-Newtonian pressure gradient which is balanced by a gradient with zero flow. Dissert. Abstr.

N83-13386*# Systems and Applied Sciences Corp., Hampton, Va.
ANALYSIS OF AN EXISTING EXPERIMENT ON THE INTERACTION OF ACOUSTIC WAVES WITH A LAMINAR BOUNDARY LAYER Final Report
M. R. Schopper Washington NASA Nov. 1982 107 p refs
(Contract NAS1-16572)
(NASA-CR-3620; NAS 1.26:3620) Avail: NTIS HC A06/MF A01 CSCL 20D

The hot-wire anemometer amplitude data contained in the 1977 report of P. J. Shapiro entitled, "The Influence of Sound Upon Laminar Boundary" were reevaluated. Because the low-Reynolds number boundary layer disturbance data were misinterpreted, an effort was made to improve the corresponding disturbance growth rate curves. The data are modeled as the sum of upstream and downstream propagating acoustic waves and a wave representing the Tollmien-Schlichting (TS) wave. The amplitude and phase velocity of the latter wave were then adjusted so that the total signal reasonably matched the amplitude and phase angle hot-wire data along the plate laminar boundary layer. The revised rates show growth occurring further upstream than Shapiro found. It appears that the premature growth is due to the adverse pressure gradient created by the shape of the plate. Basic elements of sound propagation in ducts and the experimental and theoretical acoustic-stability literature are reviewed. A.R.H.

N83-13387*# Colorado State Univ., Fort Collins. Fluid Mechanics and Wind Engineering Program.
TURBULENCE EFFECT ON CROSSFLOW AROUND A CIRCULAR CYLINDER AT SUBCRITICAL REYNOLDS NUMBERS Final Report
Willy Z. Sadeh and Daniel B. Saharon Washington NASA Nov. 1982 153 p refs
(Grant NsG-3127)
(NASA-CR-3622; NAS 1.26:3622; CER-81-82-WZS-DBS51) Avail: NTIS HC A08/MF A01 CSCL 20D

An investigation of the effect of freestream turbulence on the flow around a smooth circular cylinder at subcritical Reynolds numbers from 5.2 x 10 to the 4th power to 2.09 x 10 to the 5th power was conducted. Measurements show that the interaction of incident turbulence with the initial laminar boundary layer: (1) modifies the characteristics of the mean surface pressure distribution; (2) induces an aft shift in the separation point ranging from 5 to 50 beyond the laminar separation angle of 80 degrees; and, (3) reduces the mean drag coefficient to values between 97 and 46% of its nearly constant laminar counterpart. The extent of these changes depends on the particular Reynolds number background turbulence combination. These results demonstrate that a boundary-layer flow similar to that found in critical, supercritical and/or transcritical flow regimes is induced by turbulence at subcritical Reynolds numbers and, hence, the effect of turbulence is equivalent to an effective increase in the Reynolds number. The change in the nature and properties of the boundary layer in the subcritical regime, consequent upon the penetration of turbulence into it, is in agreement with the model proposed by the vorticity-amplification theory. Author

N83-13388# Toronto Univ. (Ontario). Inst. of Aerospace Studies.
DOMAINS AND BOUNDARIES OF PSEUDO-STATIONARY OBLIQUE SHOCK-WAVE REFLECTIONS IN AIR
J.-H. Lee and I. I. Glass Jun. 1982 57 p refs
(UTIAS-262; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

The reflection of oblique waves in air in pseudo-stationary flow was investigated analytically and numerically. The transition boundaries between the four types of shock wave reflection (regular

RR, single Mach SMR, complex Mach CMR and double Mach DMR) were established up to M sub s = 20 for both perfect and imperfect air in thermodynamic equilibrium (rotation-vibration coupling, vibrational excitation, dissociation, electronic excitation and ionization). In addition, an analysis was made for perfect gases with differing gamma in order to clarify the effects of the specific heat ratio gamma on the shock wave configurations. It was verified that the reflected wave angle omega' was a very sensitive function of gamma and a decrease in gamma lowered the value of omega' significantly and even shifted the value of omega' towards negative values under certain conditions of Mach reflection. This phenomenon occurred in a perfect gas with gamma less than 1.4 and in imperfect air. Results show no crossings of transition lines and removes the conjecture of possible triple Mach reflection. S.L.

N83-13389# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

TRANSPORT COEFFICIENTS FOR A HEAT EXCHANGER AND FOR A COMPACT MASS [COEFICIENTES DE TRANSPORTE PARA UM TROCADOR DE CALOR E MASSA COMPACTO]

F. E. M. Saboya and E. A. G. Pereira Sep. 1982 25 p refs In PORTUGUESE Presented at the 1st Latin Am. Conf. on Transfer of Heat and Mass, La Plata, 31 Oct. - 4 Nov. 1982

(INPE-2527-PRE/196) Avail: NTIS HC A02/MF A01

Heat transfer in a duct composed of two convex arco-cylindrical isothermic sides having the same radius and having an adiabatic plane base was investigated. The coefficients of forced convective heat transfer in the laminar regime of this channel were determined. The method of the analogy of heat and mass transfer was employed throughout. The sublimation of naphthalene, which requires precision instruments and controlled environmental conditions, was investigated. J.D.

N83-13390# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NOTES ON THE CALCULATION AND CONSTRUCTION OF A DEVICE FOR MEASURING OUTFLOW BY VISCOSITY [NOTA SOBRE CALCULO E CONSTRUCAO DE MEDIDOR DE VAZAO FOR EFEITO VISCOSO]

H. daSilva Couto and E. A. Gomes Pereira Jun. 1982 10 p refs In PORTUGUESE Submitted for publication

(INPE-2429-PRE/133) Avail: NTIS HC A02/MF A01

The design calculations for a device for measuring the flow rate of gases using viscosity are presented. The device is recommended for the measurement of unsteady flows when other measuring instruments are unsatisfactory. A schematic drawing of a micromanometer used for measuring exhaust gases from an internal combustion engine is presented. J.D.

N83-13391*# Science Applications, Inc., Chatsworth, Calif. Combustion Science and Advanced Technology Dept.

ASSESSMENT OF TURBULENT MODELS FOR SCRAMJET FLOWFIELDS Final Report

M. M. Sindir and P. T. Harsha Washington NASA Nov. 1982 140 p refs

(Contract NAS1-15988)

(NASA-CR-3643; NAS 1.26:3643; SAI-82-038-CHA) Avail: NTIS HC A07/MF A01 CSCL 20D

The behavior of several turbulence models applied to the prediction of scramjet combustor flows is described. These models include the basic two equation model, the multiple dissipation length scale variant of the two equation model, and the algebraic stress model (ASM). Predictions were made of planar backward facing step flows and axisymmetric sudden expansion flows using each of these approaches. The formulation of each of these models are discussed, and the application of the different approaches to supersonic flows is described. A modified version of the ASM is found to provide the best prediction of the planar backward facing step flow in the region near the recirculation zone, while the basic ASM provides the best results downstream of the recirculation. Aspects of the interaction of numerica modeling and turbulences modeling as they affect the assessment of turbulence models are discussed. S.L.

N83-13392*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF PREDICTED AND EXPERIMENTAL EXTERNAL HEAT TRANSFER AROUND A FILM COOLED CYLINDER IN CROSSFLOW

Francis S. Stepka and Raymond E. Gaugler [1981] 14 p refs To be presented at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, 27-31 Mar. 1983; sponsored by ASME

(NASA-TM-83017; E-1452; NAS 1.15:83017) Avail: NTIS HC A02/MF A01 CSCL 20D

Calculations were made of the film cooling provided by rows of holes around the circumference of a cylinder in crossflow and the results were compared to experimental data. The calculations and experimental data were for conditions that simulate most of those that are typical of air cooled turbine vane leading edges. Injection was from a single and multiple rows of holes located at different angular locations from the stagnation line. The holes in the rows were angled normal to the flow direction and at a 25 degree angle to the cylinder wall. The calculations and experimental data were for several constant values of blowing ratios for all rows and for different blowing ratios for each row, representing a simulation of a common coolant plenum supply to multiple rows of holes. The calculations were made using a finite difference boundary layer code, STAN5. Contrary to initial expectations that injection would trip the boundary layer flow into the turbulent regime, the results indicated that the high free stream acceleration apparently kept the flow laminar for holes in the first 45 degrees past stagnation. The trend in Stanton number reduction due to coolant injection was predicted with generally good agreement at the lower blowing rates, but for multile rows of holes, agreement was poor beyond the first row. Author

N83-13393*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN EXPERIMENTAL DOCUMENTATION OF A SEPARATED TRAILING-EDGE FLOW AT A TRANSONIC MACH NUMBER

P. R. Viswanath and J. L. Brown Nov. 1982 53 p refs

(NASA-TM-84290; A-9074; NAS 1.15:84290) Avail: NTIS HC A04/MF A01 CSCL 20D

A detailed experiment on the separated flow field at a sharp trailing edge is described and documented. The separated flow is a result of sustained adverse pressure gradients. The experiment was conducted using an elongated airfoil-like model at a transonic Mach number and at a high Reynolds number of practical interest. Measurements made include surface pressures and detailed mean and turbulence flow quantities in the region just upstream of separation to downstream into the near-wake, following wake closure. The data obtained are presented mostly in tabular form. These data are of sufficient quality and detail to be useful as a test case for evaluating turbulence models and calculation methods. Author

N83-13394*# Florida Univ., Gainesville. Dept. of Engineering Sciences.

THE INVESTIGATION OF FLOW INSTABILITIES ON A ROTATING DISK WITH CURVATURE IN THE RADIAL DIRECTION Final Report, 1 Oct. 1980 - 31 Dec. 1981

Paul A. Intemann and Mark H. Clarkson 14 Dec. 1982 49 p refs

(Grant NAG1-104)

Avail: NTIS HC A03/MF A01 CSCL 20D

The major objective is to explore any visible differences of the flow field with wall curvature of the test body, including possible interaction between Taylor-Gortler instabilities present along concave walls and the inflexional instabilities investigated here. An experimental study was conducted with emphasis placed on making visual observations and recording photographically the flow instabilities present under three different rotating bodies: a flat disk, a concave paraboloid, and a convex paraboloid. The data collected for the three test bodies lead to the conclusion that the

wall curvature of the concave and convex paraboloids did not alter the observed flow field significantly from that observed on the flat disk. L.F.M.

N83-13395# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MOVING BOUNDARY PROBLEM MODELLING DIFFUSION WITH NONLINEAR ABSORPTION Ph.D. Thesis North Carolina State Univ.
David Michael Lyons 1982 78 p refs
(AD-A119086; AFIT/CI/NR-82-28D) Avail: NTIS HC A05/MF A01 CSCL 12/1

A moving boundary problem involving a parabolic differential equation with a nonlinear absorption function f and with a constant coefficient of diffusion is analyzed. GRA

N83-13396# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
NAVIER-STOKES SOLUTIONS FOR AN AXISYMMETRIC NOZZLE IN A SUPERSONIC EXTERNAL STREAM Final Report, Jun. 1978 - Apr. 1981
Gerald A. Hasen Mar. 1982 138 p refs
(AF Proj. 2307)
(AD-A119074; AFWAL-TR-81-3161) Avail: NTIS HC A07/MF A01 CSCL 20/4

Numerical solutions of the Navier-Stokes equations are obtained for an axisymmetric nozzle in supersonic external stream (M infinity = 1.94, Mj = 3.0, Re infinity = 2.2 x 10 to the 6th power). Five jet pressure conditions ranging from a highly over-expanded case which exhibits a Mach disc shock formation to a slightly under-expanded case are examined and solved numerically. MacCormack's explicit method is applied as the numerical algorithm. An adaptive grid scheme is utilized in the nozzle wake to allow the fine mesh region of the computational grid to remain in areas containing relatively high flow gradients. Locally dependent eddy viscosity modelling is applied in the form of a Cebeci-Smith two-layer model in the boundary layer regions on the nozzle walls, and a form of the Prandtl mixing length model in the nozzle wake. A two-dimensional wedge flat plate validation case was computed using these models with excellent results. The computational solutions of the axisymmetric nozzle accurately reproduced the experimentally observed viscous effects on the nozzle base pressure and shock wave locations that are caused by the thick nozzle base annulus. Correct transition was achieved numerically from regularly reflected shock waves at the line of symmetry in the jet core to a Mach disc reflection at the appropriate nozzle static pressure ratio. Author (GRA)

N83-13397# Maine Univ., Orono. Dept. of Physics and Astronomy.
INVESTIGATIONS OF TURBULENCE, MICROBUBBLES, ACOUSTIC STREAMING, NONLINEAR WAVE PHENOMENA AND HEAT TRANSFER IN LIQUID HELIUM Final Report, 1 Oct. 1976 - 31 Mar. 1982
Charles W. Smith Mar. 1982 14 p refs
(Grant AF-AFOSR-3113-76; AF Proj. 1201)
(AD-A118922; AFOSR-82-0672TR) Avail: NTIS HC A02/MF A01 CSCL 20/1

The authors feel that this project has been very productive and has lead to a clearer understanding of nonlinear wave phenomena in liquid helium, generation of turbulence in liquids and acoustic enhancement of heat transfer at a liquid-solid interface. GRA

N83-13398# Naval Research Lab., Washington, D. C. Lab. for Computational Physics
LINEAR THEORY OF THE RAYLEIGH-TAYLOR INSTABILITY AT THE INTERFACE BETWEEN TWO COMPRESSIBLE MEDIA
D. L. Book and I. B. Bernstein (Yale Univ.) 9 Sep. 1982 20 p refs Sponsored in part by DOE
(AD-A119248; NRL-MR-4880) Avail: NTIS HC A02/MF A01 CSCL 20/4

Linear eigenfrequencies are calculated for infinitesimal perturbations of the systems consisting of two semi-infinite regions, each filled with a constant-temperature ideal polytrope stratified exponentially against gravity. The linear growth rate for the Rayleigh-Taylor instability which occurs when the density above the interface exceeds that below it is shown in the model to vary linearly with the wavenumber k as k yields 0. The incompressible fluid result is obtained when the adiabatic index (gamma yields infinity (i.e., compressible fluids), the growth rates are in general larger than in the incompressible case. Numerical results and limiting cases are described which illustrate this conclusion. Author (GRA)

N83-13399# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF COHERENT STRUCTURE IN THE TURBULENT BOUNDARY LAYER Annual Scientific Report, 1 May 1981 - 30 Apr. 1982
D. E. Abbott, C. R. Smith, and J. D. A. Walker 30 Jun. 1982 32 p refs
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A119244; ASR-2; AFOSR-82-0684TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The experimental video flow visualization and a series of theoretical models based upon the three dimensional details of convected, coherent structural elements of a turbulent flow as it interacts with a solid surface were investigated. The following topics are discussed: coherence, three dimensional flow, mathematical models, numerical analysis, pressure gradients, interactions, walls, vortices, Reynolds number, predictions, numerical methods and procedures, flow visualization, flow fields. GRA

N83-13400# Utah Univ., Salt Lake City. Research Inst.
SPXCPL: TWO-DIMENSIONAL MODELING PROGRAM OF SELF-POTENTIAL EFFECTS FROM CROSS-COUPLED FLUID AND HEAT FLOW, USER'S GUIDE AND DOCUMENTATION FOR VERSION 1.0
W. R. Sill and T. J. Killpack Mar. 1982 29 p refs
(Contract DE-AC07-79ID-12079)
(DE82-019908; DOE/ID-12079-60) Avail: NTIS HC A03/MF A01

The program is applicable to the calculation of self-potential effects due to fluid flow (electrokinetic effects) and heat flow (thermoelectric effects). The geological structure is two dimensional but the sources can be either finite line sources or point sources. The accuracy of the calculated potentials depends on the model discretization and the distance from the source(s). For the default mesh, the accuracy is usually a few percent at a distance of about one unit from the source. Surface boundary conditions for the primary problem require careful consideration as the form of the flow near the air-earth interface can have a profound effect on the resultant electric potentials. For temperature problems the appropriate boundary condition is a constant temperature, which is taken as zero. With this boundary condition there is a normal flux of heat at the surface and there will be induced electrical sources here, if the surface medium has a nonzero coupling coefficient. In the models, zero temperature at the surface is produced by giving the air a very large thermal conductivity. DOE

N83-13401# Massachusetts Inst. of Tech., Cambridge. Gas Centrifuge Theory Group.
SIMULATION OF COUNTERCURRENT FLOW IN A GAS CENTRIFUGE
H. P. Greenspan 22 Apr. 1982 19 p refs
(Contract DE-AC05-82OR-20900)
(DE82-018335; UVA-ER-746-82U) Avail: NTIS HC A01/MF A01

Certain effects of geometry and configuration on the circulation patterns in a gas centrifuge can be readily explored and tested in a liquid simulator. Since the most interesting situations involve countercurrent flows, the simulator must be one in which such motion is both easy to produce and accessible for experimentation. An apparatus that seems to meet these requirements is a partially filled rotating cylinder, which has one endplate that rotates with a slightly different angular velocity. The device, shown schematically can be modified to produce source-sink or mass driven flows as well. The rotation rates, fluid volume fraction (i.e., the thickness

of the fluid layer) and the fluid rheology are the main control factors to be set in any experiment. DOE

N83-13402# Carrier Corp., Syracuse, N.Y.
NORTHERN-CLIMATE HEAT-PUMP FIELD PERFORMANCE EVALUATION Final Report
W. R. Ready and C. E. Bullock Jul. 1982 86 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 789-1)
(DE82-905832; EPRI-EM-2319) Avail: NTIS HC A05/MF A01

The field data and related analysis for four residential and one commercial heat pump installation are presented. Results that cover both heating and cooling operation are presented for an initial period of one year. Additional results reflecting changes in heat pump equipment and controls are presented for selected sites. The building structures, the associated heat pumps, and the instrumentation system used to record the performance data are described. DOE

N83-13403# Oak Ridge National Lab., Tenn.
PRESSURIZED-THERMAL-SHOCK TESTS
G. D. Whitman 1981 18 p refs Presented at the 9th Water Reactor Safety Res. Inform. Meeting, Washington, D.C., 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002738; CONF-811042-16) Avail: NTIS HC A02/MF A01

Pressurized thermal shock experiments are required to validate methods of fracture analysis to establish the degree of conservatism or accuracy involved in predictions of flaw behavior under certain accident conditions. By using methods and facilities developed for this purpose, materials and loading regimes are simulated to evaluate the integrity of flawed reactor pressure vessels subjected to pressurized thermal shock transients. These accidents involve small break loss of coolant accidents, steamline breaks, and other similar overcooling accident scenarios involving combined temperature and pressure transients. DOE

N83-13404# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL RESEARCH OF PROBABILITY AND PROPERTIES OF VORTICES AT THE EDGES OF A TURBULENT CYLINDRICAL WAKE Thesis [EXPERIMENTELLE UNTERSUCHUNGEN UEBER HAEUFIGKEIT UND EIGENSCHAFTEN DER WIRBELSTRUKTUREN AM RAND EINES TURBULENTEN ZYLINDERNACHLAUFS]
Volkmar Delitzsch May 1982 53 p refs In GERMAN
(MPIS-6/1982) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,15

Based on data acquisition of temperature and velocity distribution in turbulent flow structures as they exist at the edges of a cylindrical wake at Reynolds values of 50,000, it is proved that the temperature distribution in such vortices can be explained qualitatively by a simple model. Complicated temperature and velocity distributions can be explained by the combination of simple basic structures. The frequency distribution of the time interval between two consecutive vortices can be represented as the combination of a distribution representing the probability of wake structures in time intervals according to Strouhal frequency. Measurements made with seven sensible sondes in direction of the wake axis, confirmed existance of privileged directions with a high vortex apparition frequency. Author (ESA)

N83-13405# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
AN INVESTIGATION INTO THE ADVANTAGES OF FLUIDICS IN FLUID PROCESSING. PART 3: AN INVENTORY OF SIGNAL FLUIDICS
R. L. Woods Jun. 1982 32 p refs
(Contract STU-79-6662)
(FFA-TN-1982-18) Avail: NTIS HC A03/MF A01

The principles and techniques of sensing, computing and signal processing, and control, used in signal fluidic circuits and systems, are introduced. General circuit configurations which exploit these techniques are discussed and compared with circuits based on other control technologies. Although fluidics is computationally slower than electronics and requires a high power level for computation, interfaces with the rest of the system are simpler, and fluidic circuits are not prone to environmental interference. Fluid power achieves a large amount of actuation power in a small volume, but it should not be used when high precision and flexibility are required. Author (ESA)

N83-13406# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
MULTIPLE GRID METHOD FOR THE CALCULATION OF POTENTIAL FLOW AROUND THREE DIMENSIONAL BODIES
H. Wolff Jan. 1982 24 p refs Submitted for publication
(MC-NW-119/82) Avail: NTIS HC A02/MF A01

The classical approach of representation of the solution by means of a doublet distribution on the boundary of the domain is considered. From the boundary condition, a Fredholm integral equation for the doublet distribution, mu, is obtained. By a piecewise constant function, mu is approximated. This numerical method results in a nonsparse system that is solved by a multiple grid iterative process. The convergence rate of this process is discussed and its performance is compared with the Jacobi iterative process. For flow around an ellipsoid, the multiple grid process turns out to be much more efficient than the Jacobi iterative process.
Author (ESA)

N83-13407# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
MIXED DEFECT CORRECTION ITERATION FOR THE ACCURATE SOLUTION OF THE CONVECTION DIFFUSION EQUATION
P. W. Hemker Jan. 1982 20 p refs Submitted for publication
(MC-NW-122/82) Avail: NTIS HC A02/MF A01

The mixed defect correction iteration method is considered. The iteration method is described for application to the convection diffusion equation in two dimensions. The convergence of the iteration process is studied. The downstream boundary layer behavior is analyzed. The model problems are discretized by the finite element method and the solution of the linear systems is obtained by a multiple grid method that is fully consistent with the finite element discretization. The numerical results are shown.
Author (ESA)

N83-13408# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
THE MULTIGRID METHOD AND ARTIFICIAL VISCOSITY
E. J. Vanasselt Feb. 1982 17 p refs Submitted for publication
(MC-NW-123/82) Avail: NTIS HC A02/MF A01

The convergence behavior of the multigrid method is examined for different choices of artificial viscosity in the coarse-grid operators. The two and multilevel algorithms are studied when they are applied to the convection diffusion equation in two dimensions with small diffusion coefficient. Two choices of additional artificial viscosity (currently used to avoid unstable discretizations) are studied by local mode analysis. It is shown that for a two level algorithm it is better to choose equal values of additional artificial viscosity for the coarse grid and the fine grid. Author (ESA)

N83-13409# Rolls-Royce Ltd., Derby (England).
FLUID MECHANICS: EXPLICIT SECOND ORDER SPLITTING UP (DISINTEGRATION) SCHEMES WHICH PRODUCE SHOCK CONTOURS WITHOUT OSCILLATION
Pierre Laval Mar. 1982 7 p refs Transl. into ENGLISH from C.R. Acad. Sci. (Paris), v. 292, Ser. 2, 12 Jan. 1981 p 125-128
(PNR-90127; Trans-16047; TLT-00866) Avail: NTIS HC A02/MF A01

A general class of explicit second order schemes is applied to the solution of the Cauchy problem with shock wave for a model. The equivalent equations or equations discretized to the third order by the disintegration schemes are given. A subclass of optimum schemes, i.e., dissipative with a minimum dissipation

coefficient, and a subclass of error minimizing schemes are derived. A problem in which the initial compression contour connecting two constant states is transformed after a few cycles into a shock wave which moves parallel to the initial direction is solved numerically. It is thus demonstrated that the subclasses enable oscillation free shock contours to be obtained without the addition of artificial viscosity. Author (ESA)

N83-13410# Rolls-Royce Ltd., Derby (England).
INFLUENCE OF SINGLE RESISTANCE FEATURES ON THE DISCHARGE COEFFICIENT FOR A STANDARDISED ORIFICE NOZZLE OR VENTURI. EXPERIMENTAL STUDY
P. Nagel and A. Jaumotte 15 Jan. 1982 15 p refs Transl. into ENGLISH from PROMOCLIM E Etudes Thermiques et Aerauliques (France), v. 9E, no. 1, Jan. 1978 p 34-47
(PNR-90131; Trans-15986; TLT-00852) Avail: NTIS HC A02/MF A01

The relative error in the discharge coefficient was established as a function of the straight length between the single resistance and the orifice nozzle or venturi placed downstream from the resistance feature. Results were compared with those for a standardized diaphragm. Results were recorded as graphs E(L), where E = a mean value determined for Reynolds numbers 50,000 and 70,000, L = distance between resistance feature and nozzle or venturi, expressed in diameters (D). Graphs for all tests are consistent. At a fixed distance upstream L, the value of E is far lower for the nozzle and venturi than that obtained for the diaphragm. This result was expected owing to the reduction in the area ratio from 0.5 to 0.34. Author (ESA)

N83-13411# Rolls-Royce Ltd., Derby (England).
AN ANALYTICAL STUDY OF MOMENTUM AND HEAT TRANSFER IN TURBULENT FORCED CONVECTION IN RECTANGULAR CHANNELS WITH ALLOWANCE FOR SECONDARY EFFECTS
H. Nagel May 1982 32 p refs Transl. into ENGLISH from Waerme- u. Stoffuebertragung (West Germany), v. 12, 1979 p 89-104
(PNR-90146; Trans-15891; TLT-00847) Avail: NTIS HC A03/MF A01

The effects of the anisotropic turbulent transport properties and turbulence-induced secondary flow on the main flow field and the temperature distribution in a rectangular channel under fully developed flow and heat transfer conditions were analyzed. The effects of peripheral wall conduction and radiation within the channel were also studied. The analysis reveals that only a single secondary current occurs in the trapezoidal symmetry element of the rectangular duct. When the heating extends over one or two oppositely located sides only, the location of the maximum wall temperature is shifted from the corner to the center of the wall. Author (ESA)

N83-13412# Rolls-Royce Ltd., Derby (England).
FLUID MECHANICS: AN ASYMPTOTIC FORMULATION OF AN INCOMPRESSIBLE FLUID BETWEEN TWO ROTATING COAXIAL DISKS IN CLOSE PROXIMITY
Arthur Dyment Mar. 1982 6 p refs Transl. into ENGLISH from C.R. Acad. Sci. (Paris), V. 292, Ser. 2, 12 Jan. 1981 p 129-132
(PNR-90126; Trans-16048; TLT-00867) Avail: NTIS HC A02/MF A01

The equations governing the constant flow between two coaxial disks, rotating at a steady speed, where the distance between the disks (H) is very small compared with the radius (L) of the smaller disk, are solved. The lower boundary layer problem is shown to be identical to the Bodewadt problem. The upper boundary layer equations are also similar to this, although their integration requires that data on the flow in the Euler zone be known. Experimental and numerical results confirm that the tangential axial component of speed is virtually constant, and that the radial component is very small in the central zone. The reliability of these results increases the smaller the ratio H/L becomes, and the greater the Reynolds number times H/L squared becomes. Author (ESA)

N83-13413# British Aerospace Aircraft Group, Preston (England). Aerodynamics Dept.
THE STRENGTHS AND WEAKNESSES OF COMPUTATIONAL FLUID MECHANICS (CFM) IN AERODYNAMIC DESIGN AND ANALYSIS. PART 1: BACKGROUND AND PHILOSOPHY
B. Hunt, W. R. Marchbank, and B. L. Hewitt 1981 83 p refs
Avail: Issuing Activity

The capabilities of modern theoretical methods for predicting some of the more important types of aerodynamic flow are summarized and the likelihood of their development and acceptance as routine, mainstream tools of the aircraft aerodynamicist are discussed. The impact of the new generation of computers and the associated numerical algorithms on the ability to solve large systems of differential equations, significantly reducing the need for expensive, time-consuming wind-tunnel tests and transforming aircraft design from a black art to an exact science is examined. The concept of validation of computational fluid mechanics methods is developed, involving the assessment of the accuracy with which the numerical method solves the boundary value problem posed. The methods discussed include linearized potential flow methods, nonlinear potential flow methods, the transonic small perturbation theory and exact inviscid flow methods. Author (ESA)

N83-13414# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
FLOODING EXPERIMENTS IN TUBULAR GEOMETRY WITH STEAM WATER UP TO 70 BAR
L. Augello and R. Martini 1982 25 p refs Presented at European Two-Phase Flow Group Meeting, Paris, 1-5 Jun. 1982 Sponsored by Comitato Nazionale per l'Energie Nucleare, Rome
(CISE-1789) Avail: NTIS HC A02/MF A01

An experimental study was performed to obtain countercurrent flow limitation data over a range of conditions as near as possible to that of a PWR pressurizer surge-line. Experiments were performed with two different tube diameters (73.6 and 95 mm), and two different geometrical arrangements (vertical and horizontal) at pressures ranging from 30 to 70 bar. Liquid was delivered to the test section from an upper reservoir, under a water head, while steam was injected through a lower reservoir. Measurements of the liquid flow rate and of the pressure drops versus the steam flow rate are presented, and analyzed in terms of the Wallis nondimensional parameters. Comparisons with existing models show a good agreement with the Wallis correlation, and with the Richter correlation. Author (ESA)

N83-13415# Science Research Council, Chilton (England).
HEAT STORAGE AND HEAT PUMPS
F. M. Russell 1982 16 p Summary of workshop held at Coseners House, England, 3-4 Feb. 1982
(PB82-226481; RL-82-031) Copyright. Avail: NTIS HC A02/MF A01 CSCL 13A

The subject of the Workshop was the case for, and technological aspects of combined heat stores and heat pumps. The objective was to identify areas of uncertainty or novelty to assist in formulating a program of perceived relevance to industry. It was concluded that combining heat stores with heat pumps increased the application areas gas heat pumps and gave increased flexibility in sizing and operation of such installations. Author (GRA)

N83-13416# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
PREDICTION OF INCOMPRESSIBLE LAMINAR SEPARATED FLOWS USING THE PARTIALLY PARABOLIZED NAVIER-STOKES EQUATIONS
N. K. Madavan and R. H. Pletcher Feb. 1982 147 p
(Grant NSF ENG-78-12901)
(PB82-228958; ISU-ERI-AMES-82127) Avail: NTIS HC A07/MF A01 CSCL 20D

The partially-parabolized Navier-Stokes equations are evaluated for steady, two-dimensional, laminar, incompressible flows with small, confined regions of recirculation. The equations are solved in primitive variables using finite-difference techniques. The solution

procedure involves solving the momentum equations by repeatedly space-marching in the main flow direction. Type-dependent differencing is used to enable downstream-marching even in the reverse-flow region. This same computational strategy is also applied to the full Navier-Stokes equations. External, separated flows as well as the internal, separated flow in a channel with a symmetric, sudden expansion are also considered. GRA

N83-13417# Aeronautical Research Inst. of Sweden, Stockholm.
MEASURING THE FLOW PROPERTIES OF SLOTTED TEST-SECTION WALLS
Sune B. Berndt (Royal Inst. of Technology, Stockholm) 1982 18 p refs In ENGLISH; SWEDISH and FRENCH summaries
(PB82-239849; FFA-135) Avail: NTIS HC A02/MF A01 CSCL 14B

By measuring pressure distributions at two levels near a slotted wall it is possible to deduce simultaneous values of normal and longitudinal velocities. Such measurements require, for their proper interpretation, a basic understanding of the flow in the neighborhood of the wall. The problems involved are analyzed. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N83-13418*# Lockheed Missiles and Space Co., Palo Alto, Calif.
TECHNIQUES FOR THE MEASUREMENTS OF THE LINE OF SIGHT VELOCITY OF HIGH ALTITUDE BARIUM CLOUDS Final Report
S. B. Mende [1981] 31 p refs
(Contract NASw-3415)
(NASA-CR-169394; NAS 1.26:169394) Avail: NTIS HC A03/MF A01 CSCL 14B

It is demonstrated that for maximizing the scientific output of future ion cloud release experiments a new type of instrument is required which will measure the line of sight velocity of the ion cloud by the Doppler Technique. A simple instrument was constructed using a 5 cm diameter solid Fabry-Perot etalon coupled to a low light level integrating television camera. It was demonstrated that the system has both the sensitivity and spectral resolution for the detection of ion clouds and the measurement of their line of sight Doppler velocity. The tests consisted of (1) a field experiment using a rocket barium cloud release to check the sensitivity, (2) laboratory experiments to show the spectral resolving capabilities of the system. The instrument was found to be operational if the source was brighter than about 1 kilorayleigh and it had a wavelength resolution much better than .2A which corresponds to about 12 km/sec or an acceleration potential of 100 volts. Author

N83-13419*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMAGE DEGRADATION IN LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL
W. L. Snow, A. W. Burner, and W. K. Goad Nov. 1982 24 p refs
(NASA-TM-84550; L-15512; NAS 1.15:84550) Avail: NTIS HC A02/MF A01 CSCL 14B

The optical quality of gas in a cryogenic wind tunnel was determined by observing Sayce targets through different path-lengths of the medium. The data were used to determine the square wave response of the test gas. At conditions corresponding to 15 times ambient density, considerable decrease in response to higher spatial frequencies was noted even in the absence of flow. Under flow conditions, vibrations further degraded the response. The results are interpreted in terms of possible photogrammetric approaches to measure model deformation in large cryogenic facilities such as the National Transonic Facility. Author

N83-13420# Aeronautical Research Labs., Melbourne (Australia).
INVESTIGATION OF DISCREPANCIES IN MEASUREMENTS MADE WITH A MINILAB WBGT INDEX METER
A. Ross Sep. 1982 23 p
(ARL-SYS-Tech-Memo-64; AR-002-908) Avail: NTIS HC A02/MF A01

Measurements of wet bulb, dry bulb, globe temperaures and WBGT Index made with a particular MINILAB were found to be mutually inconsistent. An investigation into the source of the discrepancies showed that they were largely methodological and attributable to the instrument. Individual measurements of wet, dry, and globe temperatures were found to be reliable. Author

N83-13421# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYSTEM FOR MEASUREMENT OF X-RAYS USING A MERCURIC IODIDE DETECTOR [SITEMA DE MEDIDAS DE RAIOS-X COM DETETOR DE HGI2]
J. A. C. F. Neri, I. M. Martin, and F. Albernhe (CESR) Oct. 1982 15 p refs In PORTUGUESE Sponsored in part by the National Fund for the Scientific and Technological Development Submitted for publication
(INPE-2555-PRE/209) Avail: NTIS HC A02/MF A01

A semiconductor X-ray spectrometer which can be operated at ambient temperature is described. Semiconductors having a large forbidden band such as mercuric iodide or cadmium telluride are employed. Details of the fabrication, installation, and operation of a mercuric iodide detector are presented. Experimental measurement of the efficiency and resolution of the detector using radiation lines of 30.5 and 59.6 KeV (Am 241) and 43, 68, 94, and 122 KeV (Co 57) is described. For this purpose, a mercuric iodide detector, a pulse height analyzer, and associated electronics were used. J.D.

N83-13422# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MISSION SUMMARY: EXPERIMENTAL PLATFORMS WITH TRACKING GUIDANCE FOR BALLOONS (PERBOA-1) [MISSAO PEROBA-1]
Ricardo de Azevedo Mendes, Jose Carlos Maldonado, Clovis Solano Pereira, Eduardo Whitaker Bergamini, Fernando Moraes Santos, Patricio-Paul Normandin Sanz, Aydano Barreto Carleial, Wilton Fose Fleming, Carlos Eduardo Santana et al Mar. 1982 112 p refs Original contains color illustrations
(INPE-2341-RPE/406) Avail: NTIS HC A06/MF A01

The first launch of a stratospheric balloon made during the PERBOA mission is described in detail. The integration and test of the onboard telecommand and computer equipment and the scientific instrument package carried on the balloon are described. The scientific equipment was (1) a nuclear radiation measuring device (RANUC experiment), (2) an infrared sensor (RADIR equipment), and (3) a remote sensing camera (SERE experiment). Tests performed on the scientific payload and on the service equipment are described and a summary of the operational costs of the launch presented. J.D.

N83-13423*# Wisconsin Univ., Madison. Space Physics Lab.
OSO-8 SOFT X-RAY WHEEL EXPERIMENT: DATA ANALYSIS Final Report
William L. Kraushaar 1982 15 p
(Contract NAS5-22410)
(NASA-CR-170448; NAS 1.26:170448) Avail: NTIS HC A02/MF A01 CSCL 14B

The soft X-ray experiment hardware and its operation are described. The device included six X-ray proportional counters, two of which, numbers 1 and 4, were pressurized with on-board methane gas supplies. Number 4 developed an excessive leak rate early in the mission and was turned off on 1975 day number

282 except for brief (typically 2-hour) periods up to day 585 after which it as left off. Counter 1 worked satisfactorily until 1975 day number 1095 (January 1, 1978) at which time the on-board methane supply was depleted. The other four counters were sealed and all except number 3 worked satisfactorily throughout the mission which terminated with permanent satellie shut-down on day 1369. This was the first large area thin-window, gas-flow X-ray detector to be flown in orbit. The background problems were severe and consumed a very large portion of the data analysis effort. These background problems were associated with the Earth's trapped electron belts. L.F.M.

N83-13424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEDURE FOR INTERNALLY MOUNTING STRAIN GAUGES Patent Application
Jay R. Jett, Jr., inventor (to NASA) (Northrop Services, Inc., Greenbelt, Md.) Filed 8 Sep. 1982 12 p Sponsored by NASA (NASA-Case-GSC-12824-1; US-Patent-Appl-SN-415959) Avail: NTIS HC A02/MF A01 CSCL 14B

A procedure for mounting a strain gauge inside a hole in a small structural member includes the step of attaching the gauge to a surface of a solid segment conforming to the shape of the hole. A clean gauging area inside the hole is coated with an adhesive and the assembled segment and gauge are inserted into the hole simultaneously with a plugged end of a thin wall, expansible tube. After insertion, the tube is inflated and maintained at a low pressure while the adhesive cures. NASA

N83-13425*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PORTABLE PALLET WEIGHT APPARATUS Patent Application
Richard M. Day, inventor (to NASA) Filed 19 Aug. 1982 12 p (NASA-Case-GSC-12789-1; US-Patent-Appl-SN-409680) Avail: NTIS HC A02/MF A01 CSCL 14B

A portable device for weighing and determining the horizontal plane center of gravity of the Office of Space Science's integrated flight pallet is described. An assembly for use with several like units in weighing the mass of a loaded cargo pallet supported by its trunnions has a bridge frame for positioning the assembly on a transportation frame carrying the pallet while straddling one trunnion and its trunnion lock, and a cradle assembly for incrementally raising the trunnion. The mass of the trunnion is carried as a static loading by a slidable bracket mounted upon the bridge frame for supporting the cradle assembly. The bracket applies the static loading to an electrical load cell symmetrically positioned between the bridge frame and the bracket. The static loading compresses the load cell, causing a slight deformation and a potential difference at load cell terminals which is proportional in amplitude to the mass at the trunnion. NASA

N83-13426# European Organization for Nuclear Research, Geneva (Switzerland).
TEST RESULTS OF THE AFS HADRON CALORIMETER AT THE CERN ISR
O. Botner, V. Burkert, A. DiCiaccio, C. W. Fabjan, H. Gordon, P. W. Jeffreys, G. Kessler, J. Lindsay, H. J. Lubatti, W. Molzon (Pennsylvania Univ., Philadelphia) et al 1981 20 p refs Presented at the Intern. Conf. on High Energy Phys., Lisbon, 9 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-003678; BNL-30193; CONF-810760-5) Avail: NTIS HC A02/MF A01

A hadron calorimeter was designed to permit unbiased selection and study of events characterized by large transverse energy. Half of the calorimeter is installed at the Intersecting Storage Rings at CERN; in its final form it will cover the full azimuth over a polar region of 40 deg < theta < 140 deg. The calorimeter is built in a modular way from 128 uraium stacks (plus 64 copper catchers), each of which is a fine sampling uranium/copper scintillator sandwich. Uranium is used as passive absorber material to achieve optimum resolution and unbiased triggering. Fluctuations in the energy deposited by hadrons are compensated on an event-by-event basis by the energy gained from fission induced in the development of the hadronic shower. This compensation provides excellent hadron energy resolution, as well as nearly equal energy response for hadronic and electromagnetic showers. The calibration of the calorimeter modules and preliminary results from studies in a test beam are reported. DOE

N83-13427# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
WHITE-LIGHT OPTICAL INFORMATION PROCESSING AND HOLOGRAPHY Annual Report, 15 Feb. 1981 - 14 Feb. 1982
Francis T. S. Yu 3 May 1982 50 p refs
(Grant AF-AFOSR-0148-81; AF Proj. 2305)
(AD-A119220; AFOSR-82-0681TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

The first phase of our research program on white-light optical information processing and holography has been completed. In this period, we have synthesized an optical information processing system, which permits complex spatial filtering with a broad band light source. The application of this technique of optical processing with incoherent source to smeared image deblurring was carried out. Since the use of white-light source, we have extended to color image deblurring. We have also developed a new technique for image subtraction with encoded extended incoherent source. Color image subtraction with the source encoding of two narrow spectral incoherent sources has also been demonstrated. As compared with the coherent optical processing technique, we had shown that the incoherent source techniques provides better image quality, and very low coherent artifact noise. We have also shown that the incoherent optical processing system is generally economical, versatile, and easier to maintain. We have also, in this period, investigated the spatial and temporal coherence requirements for the partially coherent processing technique. Several significant results for image deblurring and image subtraction were obtained. For more efficient utilization of an extended incoherent source, a source encoding technique was developed. We have shown that, since the spatial coherence requirement is dependent upon the processing operation, a strict coherence requirement may not be needed for some optical processing operations. Thus, a reduce coherence requirement may be used for a specific processing operation. Author (GRA)

N83-13428# California Univ., Livermore. Lawrence Livermore Lab.
NEW FILTERED-XRD LOW-ENERGY X-RAY SPECTROMETER
G. Tirsell May 1982 32 p refs
(Contract W-7405-eng-48)
(DE82-019227; UCID-19394) Avail: NTIS HC A03/MF A01

The filtered X-ray diode technique used to measure absolute soft X-ray spectra at the LLNL laser irradiation facilities was reviewed. The new, improved 10 channel system, designated the H, which was installed on the Shiva target chamber and used for several target irradiation series to measure time dependent spectra in the 0.2 to 1.5 keV range is described. The dependence of sensitivity on X-ray energy is shown for each of the channels used in these measurements. Alternative channels that can be set up including an array suitable for use below 500 eV and new fluor-MCP channels for broad coverage in the .15 to 5 keV range are outlined. The addition of mirror cutoff for improved channel resolution and the time responses of the various detector cable oscilloscope systems that were employed at Shiva laser facilities are reviewed. DOE

N83-13429# Australian National Univ., Canberra. Dept. of Nuclear Physics.
TWO CRYSTAL COMPTON POLARIMETER USING STANDARD Ge(Li) DETECTORS
A. P. Byrne and A. R. Poletti Aug. 1981 16 p refs
(DE82-701844; ANU-P-814) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Two standard Ge(Li) detectors are used in a two crystal coaxial orientation for linear polarization measurements of 0.2 to 2 MeV gamma rays. The sensitivity of the polarimeter is determined

experimentally and with model calculations. The use of different geometries and kinematic gates is discussed and the usefulness of the polarimeter demonstrated with parity assignments to levels in 53 Cr. DOE

N83-13430# Brookhaven National Lab., Upton, N. Y. Technical Support Organization.

DEMONSTRATION OF AN AUTOMATED ELECTROMANOMETER FOR MEASUREMENT OF SOLUTION VOLUME IN ACCOUNTABILITY VESSELS

Sylvester Suda, Bernard Keisch, Makoto Hayashi, Takayuki Onuma, and Yoshihiro Fukuari Sep. 1981 23 p refs Presented at the Inst. of Nucl. Mater. Management Conf., San Francisco, 13 Jul. 1981 Prepared in cooperation with Power Reactor and Nuclear Fuel Development Corp, Tokai

(Contract DE-AC02-76CH-00016)

(DE82-003667; BNL-30269; CONF-810706-36) Avail: NTIS HC A02/MF A01

A system for measuring the liquid volume in input and plutonium product accountability vessels, based upon a desktop-computer-controlled electromanometer, was installed at the Tokai-Mura reprocessing plant. In-tank temperatures, pressure measurements relating to volume and density, and load-cell weights are measured cyclically and recorded. The system feasibility was demonstrated through a series of tests including vessel calibration and the effects of thermal expansion, and through use during thirteen months of on-line plant operation. The value of the operator of the recording, display, replay, data handling, and report generation features of the system was demonstrated as was the enhanced precision of the electromanometer as compared to the conventional water-filled manometer system. The automated electromanometer system consists of a pneumatic scanner, a precision electromanometer, electronic scanner, a digital voltmeter, and a desktop computer with disc and tape mass storage, cathode-ray tube graphics display, and printer output. DOE

N83-13431# California Univ., Livermore. Lawrence Livermore Lab.

RADIATION DETECTORS: NEEDS AND PROSPECTS

G. A. Armantrout 1981 11 p refs Presented at the 5th Symp. on X- and Gamma Ray Sources and Appl., Ann Arbor, Mich., 10-12 Jun. 1981

(Contract W-7405-eng-48)

(DE82-003187; UCRL-86303; CONF-810647-11) Avail: NTIS HC A02/MF A01

Important applications for X and gamma ray spectroscopy are found in prospecting, materials characterization, environmental monitoring, the life sciences, and nuclear physics. The specific requirements vary for each application with varying degrees of emphasis on either spectrometer resolution, detection efficiency, or both. Since no one spectrometer is ideally suited to this wide range of needs, compromises are usually required. Gas and scintillation spectrometers have reached a level of maturity, and recent interest has concentrated on semiconductor spectrometers. Germanium detectors are showing continuing refinement and are the spectrometers of choice for high resolution applications. The new high Z semiconductors, such as CdTe and HgI2 show steady improvement but are limited in both resolution and size and will likely be used only in applications which require their unique properties. DOE

N83-13432# Oak Ridge National Lab., Tenn.

PROPOSED DESIGN FOR A FAST (PARALLEL) PREPROCESSOR FOR THE SPIN SPECTROMETER AND OTHER EVENTFUL ALBATROSSES

David C. Hensley 1981 3 p refs Presented at the Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Oak Ridge, Tenn., 28 May 1981

(Contract W-7405-eng-26)

(DE82-002663; CONF-810523) Avail: NTIS HC A02/MF A01

The particular data acquisition/processing problems posed by the spin spectrometer at the Holified Heavy Ion Facility are discussed. DOE

N83-13433# Oak Ridge Associated Universities, Tenn. Analytical Chemistry Div.

IN-LINE MULTIWAVELENGTH PHOTOMETER FOR THE DETERMINATION OF HEAVY METAL CONCENTRATIONS

D. T. Bostick, J. E. Strain, D. M. Dixon, D. D. McCue, and M. L. Bauer 1981 11 p refs Presented at the 25th Conf. on Anal. Chem. and Nucl. Tecnol., Gatlinburg, Tenn., 6-8 Oct. 1981

(Contract W-7405-eng-26)

(DE82-001484; CONF-811025-16) Avail: NTIS HC A02/MF A01

An in-line photometer was developed for continuous monitoring of uranium and plutonium concentrations in high radiation environments of nuclear fuel reprocessing plants. The instrument is equipped with multiple narrow band interference filters to monitor sample transmission in the 400- to 800-nm range. The filters are mounted in a rotating filter wheel which is located in front of a stationary tungsten halide light source. The monochromatic light from the respective optical filters is transmitted through a fiber optic cable of up to 10 m in length to the in-line sample flow cell located within the reprocessing area. A similar length of cable returns the optical signal to the photometer where the light intensity is detected with a photomultiplier tube, amplified, and processed with a LSI-11 computer system. DOE

N83-13434# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

INVESTIGATION OF SHOCK-LIKE DENSITY VARIATIONS WITH A HOLOGRAPHIC HIGH SPEED REAL TIME INTERFEROMETER Thesis [VERDICHTUNGSSTOSSUNTERSUCHUNGEN MIT EINEM HOLOGRAFISCHEN HOCHGESCHWINDIGKEITS-REAL-ZEIT-INTERFEROMETER]

D. Basler Jun. 1982 81 p refs In GERMAN

(MPIS-8/1982; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,55

Advantages of a laser interferometer over a Mach-Zehnder interferometer for detecting density variations in very unstable flows using a high speed camera, are shown. The system is based on phase holography and consists of an argon laser pulsed by an acoustic optic coupler connected to the high speed camera. The optical system is able to produce a radiation bundle 40 cm in diameter with a focal distance of 5 m, and due to the small angle between object and reference radiation, effect of mechanical perturbations on quality is reduced. To reduce further this mechanical perturbation, the laser source is mounted on a pneumatic inflated tube. Pulse width of 20 ns, an exposure frequency of 10 kHz, and a laser output energy of 10 W are used. Due to high radiation losses of the parabolic mirror, only 1% of laser output energy attains the film. The cylindrical symmetry shock wave is obtained by discharging electric condensers in synchronism with the camera, through a 0.05 mm diameter copper wire. Author (ESA)

N83-13435# MATRA Espace, Paris-Velizy (France). Lab. de Traitement des Images.

THIRTY-TWO CLASSES COMPRESSION EXPERIMENT: SUPERVISED CLASSIFICATION AND TEXTURE EXPERIMENT

G. E. Lowitz and J. M. Vivier Paris ESA 1982 42 p refs Partly in ENGLISH and FRENCH

(Contract ESTEC-3749/78/NL-HP)

(ESA-CR(P)-1621) Avail: NTIS HC A03/MF A01

The modification of a clustering algorithm used to compress DAEDULUS images to 16 or 32 classes, followed by a comparison of the results of a supervised classification of the compressed data in 16 or 32 classes, and the evaluation of a Matra algorithm in a compression to 16 or 32 classes of LANDSAT images are discussed. Contingency tables and the detailed parameters used in the experiment are presented. It is concluded that there is no significant difference between the compression to 16 or 32 classes. The Bemzecri distances are smaller in the case of supervised classification. The texture charts of the LANDSAT images show only small differences between the original and the compressed images. Author (ESA)

N83-13436# MATRA Espace, Paris-Velizy (France). Lab. de Traitement des Images.
UNSUPERVISED HIERARCHIC CLASSIFICATION EXPERIMENT MADE ON RAW AND COMPRESSED DATA [EXPERIENCE DE CLASSIFICATION HIERARCHIQUE NON SUPERVISEE SUR DONNEES BRUTES ET DECOMPRIMEES]
Gabriel E. Lowitz Paris ESA 20 Jan. 1982 25 p refs In FRENCH
(Contract ESTEC-3749/78/NL-HP)
(ESA-CR(P)-1622) Avail: NTIS HC A02/MF A01

A study on unsupervised classification methods applicable to multispectral and monospectral images is presented. A hierarchic classification of histograms is proposed. The notion of hierarchic regrouping is explained and extended to multispectral images. LANDSAT images and DEADALUS images were processed and the original data and the data compressed in 16 and 32 classes are presented. It is shown that the utilization of compressed data tends to improve the images by sorting out the dominant classes.
Author (ESA)

N83-13437# Rolls-Royce Ltd., Derby (England). Advanced Research Lab.
HOLOGRAPHIC VIBRATION MEASUREMENT OF A ROTATING FLUTTERING FAN
Philip A. Storey 1982 11 p refs Sponsored by UK Ministry of Defence Procurement Executive
(PNR-90119) Avail: NTIS HC A02/MF A01

The use of holographic interferometry to determine the deflection shape of a rotating aero engine fan undergoing unstalled supersonic flutter is described. A mirror-Abbe image rotator was employed in a double pulse holographic system to compensate for fan rotational motion and maintain correlation between the two resultant holographic images. The mirror-Abbe unit rotated the illuminating beam and derotated the light returned from the rotating fan. Holographic interferograms were recorded of a 0.86 m diameter fan rotating at speeds just under 10,000 rpm. The amplitude and spatial distribution of blade torsion and axial bending on the fluttering fan were obtained from the holograms. Errors due to misalignment of the system and unsteady aerodynamics are discussed.
Author (ESA)

N83-13438# Rolls-Royce Ltd., Derby (England).
DIGITAL INTERFEROGRAPHIC METROLOGY
A. Choudry 22 Jan. 1982 10 p refs Transl. into ENGLISH from Ned. Tijdschr. voor Natuurkunde (Netherlands), v. A47, no. 1, 1981 p 8-11
(PNR-90130; Trans-16042; TLT-00863) Avail: NTIS HC A02/MF A01

The principles of digital interferographic metrology (DIM) are outlined, and the application of DIM to holographic interferogram analysis of convective heat transfer in solar cells is described. The method exploits the fact that an interferometric pattern is based on a structural algorithm, i.e., a transformation which relates a change in the physical variable V(x,y) with the intensity distribution of the pattern I(x,y). With DIM, V is calculated from a given experimental pattern, using a reconstructive algorithm.
Author (ESA)

N83-13439# Cincinnati Univ., Ohio. Computing Center.
AN ULTRAVIOLET-VISIBLE SPECTROPHOTOMETER AUTOMATION SYSTEM. PART 1: FUNCTIONAL SPECIFICATIONS Report, Oct. 1979 - Feb. 1980
Gregory S. Roth, John M. Teuschler, and William L. Budde Jul. 1982 56 p refs 3 Vol.
(Contract EPA-GS-05S-10458)
(PB82-244369; EPA-600/4-82-053A-Vol-1) Avail: NTIS HC A04/MF A01; also available in set of 3 reports HC E99 as PB82-244351 CSCL 14B

The project definition, the functional requirements, and the functional design for a proposed computer automation system for scanning spectrophotometers are presented. The system will be implemented on a Data General computer using the BASIC language. The system is a real-time data acquisition system with 'on-line' data reduction, quality assurance, report generation and plotting. It is designed for operation with the Environmental Protection Agency (EPA) Data General automation system. Analyses included in the system facilitate the determination of chlorophyll concentrations, the evaluation of color in waters, and a general transmittance/absorbance measurement of any given sample. Quality assurance is provided by the analysis of standard filters. Two related publications are titled, 'An Ultraviolet-Visible Spectrophotometer Automation System - Part II User's Guide' and 'An Ultraviolet-Visible Spectrophotometer Automation System - Part III Program Documentation.'
GRA

N83-13440# Cincinnati Univ., Ohio. Computing Center.
AN ULTRAVIOLET-VISIBLE SPECTROPHOTOMETER AUTOMATION SYSTEM. PART 2: USER'S GUIDE Report, Feb. - Sep. 1980
Gregory S. Roth, John M. Teuschler, and William L. Budde Jul. 1982 71 p refs 3 Vol.
(Contract EPA-GS-05S-10458)
(PB82-244377; EPA-600/4-82-053B-Vol-2) Avail: NTIS HC A04/MF A01; also available in set of 3 reports HC E99 as PB82-244351 CSCL 14B

The Ultraviolet-Visible Spectrophotometer (UVVIS) automation system facilitates computer-automated procedures for the analysis of chlorophyll concentrations and color evaluations of waters, as well as the quality assurance of the spectrophotometer. In addition to various types of reports, this system also offers plots of chlorophyll and color scan data for either plotting or non-plotting terminals. The UVVIS system also provides manual data-entry facilities for chlorophyll analysis and for three-filter photometer color analysis. The UVVIS system is described from a user's perspective. It concenrates on how one interacts with the system, and on what system features one may use. Two other related publications are 'An Ultraviolet-Visible Spectrophotometer Automation System - Part I Functional Specifications,' and 'An Ultraviolet-Visible Spectrophotometer Automation System - Part III Program Documentation.'
GRA

N83-13441# Cincinnati Univ., Ohio.
AN ULTRAVIOLET-VISIBLE SPECTROPHOTOMETER AUTOMATION SYSTEM. PART 3: PROGRAM DOCUMENTATION Report, Feb. - Jul. 1980
Gregory S. Roth, John M. Teuschler, and William L. Budde Jul. 1982 259 p refs 3 Vol.
(Contract EPA-GS-05S-10458)
(PB82-244385; EPA-600/4-82-053C-Vol-3) Avail: NTIS HC A12/MF A01; also available in set of 3 reports HC E99 as PB82-244351 CSCL 14B

The Ultraviolet-Visible Spectrophotometer (UVVIS) automation system accomplishes 'on-line' spectrophotometric quality assurance determinations, report generations, plot generations and data reduction for chlorophyll or color analysis. This system also has the capability to process manually entered data for the analysis of chlorophyll or color. For each program of the UVVIS system, this document contains a program description, flowchart, variable dictionary, code listing, and symbol cross-reference table. Also included are descriptions of file structures and of routines common to all automated analyses. The programs are written in Data General extended BASIC, Revision 4.3, under the RDOS operating ystems, Revision 6.2. The BASIC code has been enhanced for real-time data acquisition, which is accomplished by CALLS to assembly language subroutines. Two other related publications are 'An Ultraviolet-Visible Spectrophotometer Automation System - Part I Functional Specifications,' and 'An Ultraviolet-Visible Spectrophotometer Automation System - Part II User's Guide.'
GRA

N83-13442# Science Research Council, Chilton (England).
THE TASSO HIGH PRECISION VERTEX DETECTOR PROJECT
B. Foster 1982 8 p refs
(PB82-226523; RL-82-034) Copyright. Avail: NTIS HC A02/MF A01 CSCL 18D

Drift chambers of various types have now been in use in large colliding beam detectors for many years. Typical spatial

resolutions of these detectors have been around 200 micrometers. However, the theoretical limitation on the resolution attainable due to the statistical nature of the ionization process and diffusion of the electrons prior to collection is much smaller than this. Using high pressure organic gases, resolutions of better than 40 micrometers have been achieved. Both MARK II and then TASSO have proposed the construction of drift chambers close to the interaction point in e(+)e(-) colliding beam machines. The MARK II vertex detector is already installed at PEP.This paper discusses the status of the TASSO high precision vertex detector project, together with a brief description of its physics aims. GRA

N83-13443# Science Research Council, Chilton (England).
HIGH RESOLUTION ENERGY ANALYSERS FOR THE HIGH THROUGHPUT INELASTIC SPECTROMETER
J. Penfold 1982 26 p
(PB82-226580; RL-82-038) Copyright. Avail: NTIS HC A03/MF A01 CSCL 18D

The high throughout inelastic spectrometer (HTIS) designed as a high count rate instrument and is intended to provide the neutron scattering equivalent of infrared spectroscopy for the study of molecular vibrations. It will be installed initially at the Harwell Linac, and eventually on the SNS. Calculations of energy transfer resolution and count rate for different filter materials and various high resolution energy analyzers for the HTIS on the SNS, are presented. GRA

N83-13444# Science Research Council, Chilton (England). Instrumentation Div.
AN APPLE 2 BASED IMAGE DIGITIZING SYSTEM FOR USE WITH IMMUNOELECTROPHORESIS PLATES
T. E. Pritchard, J. E. Bateman, and A. C. Flesher 1982 15 p refs
(PB82-226598; RL-82-040) Copyright. Avail: NTIS HC A02/MF A01 CSCL 14B

In order to undertake basic image analysis on 2-dimensional immunoelectrophoresis plates an image digitizing system was constructed using a 48K Apple II in conjunction with a Microworks DS-65 Digisector card which takes the video signal from a television camera in a specially constructed projection box. Accuracy and reproducibility are assured by averaging up to 16 scans and normalizing to a blank plate. Careful packing of the data permits the processing of a plate on a single Apple disk while the primary disk drive carries the system software. The plate image of 70 mm by 70 mm is digitized into an array of 128 by 128 pixels each with 64 intensity levels. Author (GRA)

N83-13445# Research Triangle Inst., Research Triangle Park, N.C.
A COMPARATIVE EVALUATION OF SEVEN AUTOMATED AMBIENT NONMETHANE ORGANIC COMPOUND ANALYZERS Final Report
Frederick W. Sexton, Raymond M. Michie, Jr., F. McElroy, and Vinson L. Thompson Jun. 1982 102 p refs
(Contracts EPA-68-02-3222; EPA-68-02-3431)
(PB82-230798; EPA-600/4-82-046) Avail: NTIS HC A06/MF A01 CSCL 14B

Automated hydrocarbon analyzers representing both conventional and state-of-the-art methods for ambient hydrocarbon monitoring were tested to evaluate their performance, comparability, and reliability under typical monitoring conditions. The resulting data and the statistical evaluation of those data are summarized and discussed. The test site and support equipment utilized are also described, as are the quality control measures implemented to ensure the accuracy of the data collected. The analyzers that were evaluated were the Beckman 6800 Air Quality Chromatograph, Bendix 8201 Reactive Hydrocarbon Analyzer, Mine Safety Appliance 11-2 Methane/Nonmethane Monitor, Meloy HC 500-2C FID Hydrocarbon Analyzer, Byron 404 NMVO Analyzer, HNU PI 201 Photoionization Monitor, and the Baseline 1030A Gas Chromatograph. GRA

N83-13446# Rockwell International Corp., Newbury Park, Calif.
APPARATUS AND PROCEDURE FOR DETERMINING OIL DROPLET SIZE DISTRIBUTION Final Report, Jun. 1978 - Nov. 1980
Raymond A. Meyer, Milton Kirsch, Fred Howard, and Frank Freestone Mar. 1982 108 p refs
(Contract EPA-68-03-2648)
(PB82-231317; EPA-600/2-82-032) Avail: NTIS HC A06/MF A01 CSCL 14B

This program was initiated to develop a method and apparatus for determining the oil drop size distribution in flowing oily brine during brine cleanup treatment. An automated photomicrographic apparatus for taking time lapse photographs of oily brine that was briefly at rest is described. This apparatus meets all N.E.C. Class 1, Division 1, Group D requirements for operation where explosive concentrations of hydrocarbons are known to exist. The system demonstrates its ability to determine the size and number distribution of 2 to 100 micrometer spherical entities, and it establishes their density as well. Thus the technique can differentiate between oil drops, oil covered gas bubbles, and oil covered sand or other solids. The report presents both the techniques for reducing the photomicrographs to size and number data, and the FORTRAN programs involved. Author (GRA)

N83-13447# Lister Hill National Center for Biomedical Communications, Bethesda, Md.
MICROCOMPUTER-CONTROLLED WORLD TIME DISPLAY FOR PUBLIC AREA VIEWING
Samuel Yep and Medi Rashidian May 1982 129 p refs
(PB82-237546; LHC-NMAC-82-01) Avail: NTIS HC A07/MF A01 CSCL 14B

The design, development, and implementation of a microcomputer-controlled world clock is discussed. The system, designated international Time Display System (ITDS), integrates a Geochron Calendar Map and a microcomputer-based digital display to automatically compensate for daylight savings time, leap year, and time zone differences. An in-depth technical description of the design and development of the electronic hardware, firmware, and software systems is provided. Reference material on the time zones, fabrication techniques, and electronic subsystems are also provided. Author (GRA)

N83-13286# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
SHOCK AND VIBRATION INSTRUMENTATION
R. Plunkett *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 4, No. 9 Sep. 1982 p 3-5 refs Original document was announced as N78-72683 (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 14/2

N83-13801# Joint Publications Research Service, Arlington, Va.
DIRECT-READING DOSIMETERS USED FOR MONITORING RADIATION IN SALYUT STATIONS
V. V. Markelov and I. V. Chernykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 120-124 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 81-84 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-13448 Columbia Univ., New York.
A SUBMILLIMETER FREE ELECTRON LASER: EXPERIMENT, ANALYSIS, AND CAVITY MODE THEORY Ph.D. Thesis
David Sargent Birkett 1982 101 p
Avail: Univ. Microfilms Order No. DA8222346

A free electron laser oscillator based on stimulated Raman backscattering using a 1 MeV 20 kA electron beam pumped with

a weak (250 G), periodic lambda = 8mm) transverse magnetic field is operated as a source of high power (approximately 1MW) millimeter and submillimeter radiation, with lasing developing during the 150 nSec beam lifetime. Superluminescent and lasing operation as described at lambda approximately 1.0 mm and lambda approximately 0.6 mm. A cavity mode theory based upon orthogonal mode expansions and scalar diffraction theory is developed. Functional dependences such as radiation survival fraction and mode selectivity are found analytically as they may vary with cavity and mirror geometry and wave length. Normal cavity modes for both the open and closed laser resonator with either dielectric or conducting drift tube walls are identified and shown to depend qualitatively upon cavity Fresnel number. Dissert. Abstr.

N83-13449 Dartmouth Coll., Hanover, N.H.
CERENKOV FREE ELECTRON LASERS IN THE INFRARED Ph.D. Thesis
James Brian Murphy 1982 107 p
Avail: Univ. Microfilms Order No. DA8223853

The Cerenkov free electron laser (CFEL) is evaluated as a potential infrared radiation source. The model which is evaluated consists of a relativistic electron beam grazing the surface of a single slab dielectric waveguide. Properties of the resonator such as transverse mode spacing, scaling of the output frequency with slab thickness and dielectric constant are examined. The single slab waveguide, with a thickness on the order of the output wavelength, operating in the TM1 mode is found to be a suitable choice as a resonator for a CFEL. The small signal gain of the device is computed for the single particle interaction mechanism for the cases of an infinite and zero magnetic guide field. An examination of the expression for the gain shows it to be independent of the dielectric material for operation in the infrared regime. Although a low dielectric constant (episilon approximately 2-4) is desirable as it provides for thicker waveguides capable of handling higher power outputs. In the mm regime the gain of the CFEL is enhanced by using materials with moderately high dielectric constants (episilon approximately 10-25). Dissert. Abstr.

N83-13450# Norwegian Defence Research Establishment, Kjeller.
CONTINUOUSLY TUNABLE OPTICALLY PUMPED HIGH-PRESSURE DF YIELDS CO2
Knut Stenersen Aug. 1982 105 p refs
(NDRE-Publ-82/1003) Avail: NTIS HC A06/MF A01

The possibility of operating a continuously tunable high pressure CO2 laser by exciting the gas optically with radiation from a pulsed DF laser is studied. The pumping radiation is absorbed by DF in a high pressure DF/CO2/He mixture, and subsequent vibrational energy transfer to the CO2nu3 mode provides the CO2 laser population inversion. Continuous tuning of the CO2 laser frequency between two CO2 line centers in the R branch at 10.26 microns is demonstrated at 12 atm laser gas pressure. The operational characteristics of the laser are studied for several gas mixtures at gas pressures up to 19 atm. For a 10 atm gas mixture containing 0.6% DF, 5% CO2 and 94.4% He the maximum CO2 laser output energy obtained with a two mirror CO2 laser resonator is approximately 6 mJ, corresponding to a total quantum efficiency of 20%. The slope quantum efficiency is then about 35%. A maximum output energy of 1 mJ is obtained in the frequency tuning experiments. A theoretical laser model is outlined, and the results of computer simulations based on this model are in reasonable agreement with the experimental results. S.L.

N83-13451# Naval Research Lab., Washington, D. C.
LASER-ABLATIVE ACCELERATION OF TARGETS TO NEAR INERTIAL FUSION CONDITIONS Interim Report
B. H. Ripin, S. E. Bodner, P. G. Burkhalter, H. Griem, J. Grun, H. Hellfeld, M. J. Herbst, R. H. Lehmberg, C. K. Manka, E. A. McLean et al 30 Aug. 1982 20 p refs Presented at the 9th Intern. Conf. on Plasma Phys. and Controlled Nuclear Fusion Res., Baltimore, 1-8 Sep. 1982
(Contract DE-AI08-79DP-40092)
(AD-A119080; NRL-MR-4916) Avail: NTIS HC A02/MF A01 CSCL 20/5

NRL is investigating the physics issues involved in the direct illumination approach to laser fusion. Millimeter diameter planar targets are ablatively accelerated to speeds and conditions near those required of fusion pellet shells using 3-5 ns, 1.05 micrometer light from the PHAROS II laser. At 5 x 10 to the 13th power W/sq cm targets were accelerated to 160 km/sec with a velocity uniformity of + or - 7% through twenty times the initial target thickness and while remaining cool (<10 eV). A joint NRL-LLNL experiment on SHIVA extended these results to beyond 10 to the 14th power W/sq cm, the uniformity of acceleration of dense mm-diameter targets improved to better than + or - 3.5% and the interaction physics remained benign. Also, absorption was above 65% and fast electrons were a minor energy channel. Thus, the moderate-irradiance direct-illumination approach appears to be an attractive option for laser fusion. To further verify this conjecture, particular attention is paid to the factors affecting the uniformity of acceleration or targets such as laser beam and target uniformity requirements, and various hydrodynamic mechanisms such as Rayleigh-Taylor and Kelvin-Helmholtz instabilities. The study of the behavior of laser-plasma interactions is also extended into regimes closer to those expected to be encountered in reactor sized pellets. Large plasmas with long scalelengths are generated using two-pulse methods; backscatter, fast electron production, etc. are observed as the laser intensity is increased beyond 10 to the 14th power W/sq cm. New diagnostic techniques are also discussed for measurements of plasma properties. Author (GRA)

N83-13452# Naval Postgraduate School, Monterey, Calif.
THE CONSTRUCTION OF A Nd:YAG LASER M.S. Thesis
Jin Won Jung Jun. 1982 58 p refs
(AD-A119363) Avail: NTIS HC A04/MF A01 CSCL 20/5

A neodymium laser was constructed with a locally designed circular cylindrical pumping cavity. Laser action was achieved under conditions predicted. A Nd:YAG crystal was selected for use in the laser, and the physical and chemical properties of Nd:YAG as compiled from the literature are presented. The theoretical and experimental approach for designing the Nd:YAG laser system, and a detailed description of the laser system are given, with the expected operational characteristics extrapolated from measurements on a commercial laser. Author (GRA)

N83-13453# Rolls-Royce Ltd., Derby (England).
USE OF THE LASER INTERFEROMETER FOR LENGTH MEASUREMENT IN PRODUCTION ENGINEERING
H. Kunzmann Dec. 1981 17 p refs Trans. into ENGLISH from CIRP (West Germany), v. 28, no. 1, 1979 p 311-316
(PNR-90133; Trans-16041; TLT-00862) Avail: NTIS HC A02/MF A01

The physical principles of laser interferometry are introduced, and the alternating voltage and direct voltage methods are outlined. Uncertainties concerning measurement of the temperature of the unit tested, transmission of measurement value, and the laser interferometer itself are discussed. Application to pitch measurement on threaded spindles is illustrated. The system permits length measurement based on the wavelength of the light source, e.g., 0.633 microns for a red light helium-neon laser.
Author (ESA)

N83-13454# Rolls-Royce Ltd., Derby (England).
INSPECTION OF SURFACES BY LASER: ROUGHNESS AND PROFILE
G. Tribillon May 1982 12 p refs Transl. into ENGLISH from Qualite Rev. Prat. Controle Ind. (France), v. 19, no. 106, 1980 p 34-38
(PNR-90140; Trans-16043; TLT-00864) Avail: NTIS HC A02/MF A01

Three surface analysis techniques which use lasers and speckle methods are described. In method 1, the beam of a helium-neon laser illuminates the system under investigation. Two lenses form an image of the surface, and average roughness can be deduced from the visibility of speckle grains. In method 2, surface roughness is deduced from speckle contrast. Method 3 is based on the resemblance between two speckles produced by a

surface illuminated by two beams of different wavelengths. Intensity fluctuations depend on average roughness and spectral differences. An optical profilometer reproduces the microstructure in the range 0.1 to several microns. Roughness values between 0.05 and 10 microns can be measured. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-13455 Rensselaer Polytechnic Inst., Troy, N. Y.
LUBRICANTS IN BEARINGS AND ABSORBED MATERIALS ON AIRCRAFT FUEL LINES BY INFRARED EMISSION FOURIER MICROSPECTROPHOTOMETRY Ph.D. Thesis
Leonard Ernest Keller 1982 236 p
Avail: Univ. Microfilms Order No. DA8223323

Solid and liquid thin films were analyzed by infrared emission Fourier microspectrophotometry. Studies of lubricant behavior in a simulated ball bearing showed the alignment of the fluid molecules in the Hertzian area. Polyphenyl ether contaminated with 1% 1, 1,12-trichloroethane required far lower shear rates for the same degree of alignment than without contaminant. The experiment was run with 440 C stainless steel balls and 440 C balls coated with TiN, a chemically inert material. In both cases, the alignment was strongly influenced by the presence of the contaminant. The results showed: (1) the dependence of alignment of fluid molecules on flow and not on adsorption at metallic surfaces; (2) phase separation between lubricant and additive under high pressure which results in two-phase flow; and (3) reduction in traction of torque-transmitting (traction) fluids. With the same instrument solid deposits on aircraft fuel lines were studied. Despite the strong background radiation and the presence of a multitude of compounds, the spectral contrast was sufficient to establish a relationship between fuel and deposit composition. Dissert. Abstr.

N83-13456 Defence Research Information Centre, Orpington (England).
COMPARISON OF DIFFERENT TEST PROCEDURES FOR DETERMINING THE STARTING AND SLOW RUNNING PERFORMANCE OF HYDRAULIC MOTORS
P. Renvert and W. Weiler Aug. 1982 17 p refs Transl. into ENGLISH from O + P Oelhydraul. u. Pneumatik (West Ger.), v. 25, no. 11, 1981 p 854-857
(DRIC-T-6739; BR84552) Copyright. Avail: Issuing Activity

Technical and economic factors which influence hydraulic motor test methods are discussed. Constant forced rotation, constant volume flow, clamped shaft, and free starting tests are described. The importance of rotational angle dependent motor torque and leakage flows is stressed. Author (ESA)

N83-13457*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROLLING-ELEMENT FATIGUE LIFE WITH TRACTION FLUIDS AND AUTOMATIC TRANSMISSION FLUID IN A HIGH-SPEED ROLLING-CONTACT RIG
Richard J. Parker, Alex H. Nahm (General Electric Co., Cincinnati), and Stuart H. Loewenthal Nov. 1982 16 p refs
(Contract NAS3-20832)
(NASA-TP-2050; E-1091; NAS 1.60:2050) Avail: NTIS HC A02/MF A01 CSCL 13I

Rolling-element fatigue tests were run in standard and high-speed rolling-contact rigs at bar speeds from 5000 to 50,000 rpm to determine the effects of speed and lubricant film parameter on rolling-element fatigue life. AISI 52100 test bars were tested at a maximum Hertz stress of 4.83 GPa (700,000 psi) with three traction fluids and an automatic transmission fluid. Rolling-element fatigue life increased with speed, with the greatest increases occurring from 10,000 to 50,000 rpm. The life data tended to follow published life-versus-lubricant-film-parameter data up to a film parameter of approximately 3. Author

N83-13458*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ISOTHERMAL ELASTOHYDRODYNAMIC LUBRICATION OF POINT CONTACTS
Bernard J. Hamrock and Duncan Dowson (Leeds Univ., Engl.) Oct. 1982 84 p refs Repr. from Ball Bearing Lubrication, Sep. 1981
(NASA-TM-81696; E-209; NAS 1.15:81696) Avail: NTIS HC A05/MF A01 CSCL 13I

The influence of the ellipticity parameter and the dimensionless speed, load, and materials parameters on minimum film thickness was investigated. The ellipticity parameter was varied from 1 (a ball-on-plate configuration) to 8 (a configuration approaching a line contact). The dimensionless speed parameter was varied over a range of nearly two orders of magnitude. Conditions corresponding to the use of solid materials of bronze, steel, and silicon nitride and lubricants of praffinic and naphthemic mineral oils were considered in obtaining the exponent in the dimensionless materials parameter. Thirty-four different cases were used in obtaining the minimum film thickness formula H min = 3.63U to the 0.68 power G to the 0.49 power W to the -0.073 power 1-e to the 0.68K power). A simplified expression for the ellipticity parameter was found where k = 1.03 (r(y)/r(x)) to the 0.64 power. Contour plots were also shown which indicate in detail the pressure spike and two side lobes in which the minimum film thickness occurs. These theoretical solutions of film thickness have all the essential features of the previously reported experimental observations based upon optical interferometry. Author

N83-13459# National Aerospace Lab., Tokyo (Japan).
RESEARCH AND DEVELOPMENT OF A FLOATING-RING SEAL FOR A LIQUID HYDROGEN TURBOPUMP
Mineo Suzuki, Masataka Nosaka, Kenjiro Kamijo, Masataka Kikuchi, and Masahiro Mori 1982 31 p refs
(NAL-TR-710; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The research and development of a floating-ring seal for the liquid hydrogen turbopump is described. The floating-ring seals tested were a double ring seal and a single ring seal. The seal diameter was 32 mm and the dimetral clearances were from 24.5 to 86 micrometers. The testing was performed under the following conditions: fluid pressures of 15 ata and 19 ata, and rotating speed of 50,000 rpm. The seal performance was satisfactory under the test conditions and it was confirmed that the floating-ring seal has high-reliability for application to the liquid hydrogen turbopump. Author

N83-13460*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LINEAR MAGNETIC BEARINGS Patent Application
Michael P. Goldowsky, inventor (to NASA) (North American Phillips Corp., Briarcliff Manor, N.Y.) Filed 8 Sep. 1982 19 p Sponsored by NASA
(NASA-Case-GSC-12582-2; US-Patent-Appl-SN-415960) Avail: NTIS HC A02/MF A01 CSCL 13I

A magnetic bearing for supporting a linear armature member in suspension includes an elongated cylindrical housing having two sets of U shaped stationary electromagnets, and position sensors respectively located at each end of the housing. Each set of electromagnets preferably consists of four electromagnet assemblies located 90 deg apart around the periphery of the housing and are operable to generate four orthogonal magnetic fields within the housing. Each set of position sensors are aligned with the electromagnets to define two orthogonal horizontal and vertical axes from which signals proportional to orthogonal shaft displacement are provided. NASA

N83-13461# Battelle Columbus Labs., Ohio. Intelligence Device and Microcomputer Systems Group.
GUIDANCE AND ACTUATION TECHNIQUES FOR AN ADAPTIVELY CONTROLLED VEHICLE Interim Technical Report, 1 Feb. - 31 Jul. 1982
Mark Patterson, John Reidy, and Barry Brownstein 15 Aug. 1982 53 p refs

(Contract MDA903-82-C-0149; DARPA Order 4385)
(AD-A119131) Avail: NTIS HC A04/MF A01 CSCL 13/6

This technical report describes the progress for the first six months of a twelve month project to support the Adaptive-Suspension Vehicle program. The Battelle project consists of two major tasks. The first task relates to vehicle guidance; the objective is to derive a method to enable an active-suspension vehicle to traverse rough terrain. The second task is concerned with actuation techniques for the legs on the vehicle, specifically an in-depth analysis, design, and demonstration of the shank hydraulic circuit. This report describes progress on the development of guidance algorithms and the shank hydraulic circuit. Author (GRA)

N83-13462# Coast Guard Research and Development Center, Groton, Conn.
A SNAPBACK EVALUATION TECHNIQUE FOR SYNTHETIC LINES Final Report
Kenneth R. Bitting May 1982 55 p refs
(AD-A119070; CGR/DC-9/82; USCG-D-29-82) Avail: NTIS HC A04/MF A01 CSCL 13/10

A technique is proposed for quantifying the amount of energy released when synthetic lines fail and recoil, called snapback. Ten synthetic line material/construction combinations are investigated by bending the line around a 1' diameter pin fixture and loading until failure occurs at the pin. High-speed photography is used to calculate the velocity of the line at failure and the attending kinetic energy. Three parameters are proposed to quantify snapback; (1) the Storage Energy Potential is a measure of how much energy a line stores as load is applied to it, (2) Snapback Energy Potential is a measure of the kinetic energy that the line possesses after failure occurs and the line recoils, and (3) the Energy Release Ratio indicates the proportion of stored energy that becomes kinetic energy after the line parts. In addition to discussing the evaluation technique, the various lines tested are compared to determine if some materials or constructions have a lower potential to snapback. The failure mechanism (i.e., the sequence of yarn failures that culminate in complete failure) of each line construction is observed using high-speed photography to determine if lines with a cascading failure mechanism (i.e., failure over a relatively long period of time) have lower snapback potential. The path that a line follows during snapback is also observed. Lines snap back directly toward the fixed end if the failure occurs in clear line. If a line retracts around the curved surface as a bollard, significant lateral velocity is imparted to the line and it sweeps a wide area. Author (GRA)

N83-13463# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MEASUREMENT OF VEHICLE TIRE-TO-ROAD COEFFICIENT OF FRICTION WITH A PORTABLE MICROCOMPUTERIZED TRANSDUCER M.S. Thesis
Ronnie Lynn Coke Aug. 1982 168 p refs
(AD-A119112; AFIT/CI-NR-82-35T) Avail: NTIS HC A08/MF A01 CSCL 13/6

Accurate measurement of the tire-to-road coefficient of friction is a necessary factor in the analysis of vehicle dynamics when sliding composes part of the motion. In the past, numerous methods have been used to measure the coefficient of friction but the results of these methods seldom agree or yield the requisite accuracy necessary for a detailed analysis of vehicle dynamics. Tire traction is a complex process which has many variables. The method of using a portable accelerometer and a microcomputerized data acquisition and storage device was chosen as the best way to measure the coefficient of friction because it permits a test procedure which closely approximates the event being analyzed. Therefore, leaving the least number of variables unaccounted for. Author (GRA)

N83-13464# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.
HIGH-TEMPERATURE-TURBINE-TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES. TURBINE SPOOL TECHNOLOGY RIG FUEL-CONTAMINANT TOLERANCE TEST
Apr. 1982 105 p
(Contract DE-AC01-76ET-10348)
(DE82-020287; CW-WR-76-020.98A; FE-2291-98A) Avail: NTIS HC A06/MF A01

The durability of high temperature transpiration air cooled turbine blading under increasingly severe conditions simulating the combustion of coal derived was investigated. The test equipment, procedures and results are described. The high pressure ratio and mass flow of the TSTR produced turbine section particulate loading about twice that of the LP rig engine. The durability of this new transpiration air cooled blading to be comparable to that of the LP rig engine is shown. DOE

N83-13465# Argonne National Lab., Ill.
VEHICLE CHARACTERIZATION FOR THE TAPCUT PROJECT: PERFORMANCE AND COST
C. L. Hudson, E. S. Putnam, and M. J. Bernard Nov. 1981 143 p refs
(Contract W-31-109-eng-38)
(DE82-019772; ANX/EES-TM-171) Avail: NTIS HC A07/MF A01

Three sets of technologies for urban transportation for use in testing energy conservation strategies were developed. Each set included both personal and mass transportation vehicles; different socioeconomic conditions were assumed for each of the three sets. Vehicles in the first set combine the best performance and fuel economy characteristics while meeting stringent air emissions standards. Personal vehicles in the second set sacrifice performance for maximum fuel economy. Vehicles in the third set are more fuel efficient than 1980 vehicles but do not represent significant technological improvements from present vehicles. A forecasting vehicle characteristics method data for performance, fuel economy, and purchase price for each vehicle are presented. New engine technologies were introduced in every set, including diesel, Stirling, and Brayton engines, stratified charge Otto engines, and electric and hybrid vehicles. Technology development for transit vehicles paralleled that of autos. DOE

N83-13466# Rolls-Royce Ltd., Derby (England).
AN INTERFERENCE-FREE METHOD OF OIL FILM TRANSIENT PRESSURE MEASUREMENT IN SLIDE BEARINGS
Jan. Kicinski Jan. 1982 10 p Transl. into ENGLISH from Pomiary Autom. Kontola (Poland), v. 26, pt. 7, 1980 p 254-257
(PNR-90128; Trans-15861; TLT-00843) Avail: NTIS HC A02/MF A01

A method of building a piezoelectric transducer into a plain bearing, which makes it possible to measure transient pressures in an oil film without disturbance is presented. Quantitative relationships between transducer design parameters and operational characteristics of the whole measuring system are evaluated. The piezoelectric transducer is incorporated into the journal or bushing. The measuring probe of the transducer is sealed with epoxy resin and machined together with the bearing face of the bushing. The same transducer can, without any design changes, register pressure changes ranging from fractions to tens of MPa. Shortcomings are due mainly to the characteristics of the active elements. Relatively large variations of piezoelectric, electric, tensile properties and piezoelectric modulus with temperature do not allow for very stable measurements to be obtained and prevent static calibration of the transducer. Author (ESA)

N83-13467# Rolls-Royce Ltd., Derby (England).
SELECTIVE CORROSION IN AXIAL HYDRODYNAMIC CONTROLLED LEAKAGE SHAFT SEALS MADE FROM CARBIDE/CARBON IN ULTRAFINE, CONDITIONED POWER STATION WATER
P. H. Effertz and W. Fichte May 1982 29 p refs Transl. into ENGLISH of Der Maschinenschaden (West Germany), v. 54, no. 4 p 113-123
(PNR-90139; Trans-16039; TLT-00860) Avail: NTIS HC A03/MF A01

Ten damaged carbide/carbon sliding ring combinations from heavy duty, axial, hydrodynamic, controlled leakage shaft seals

were examined. The choice was limited to large seals subjected to oxygen conditioning and reactor cooling water of high purity, whose pH value had been reduced. The tungsten carbide rings with metallic Ni or Co binders exhibited radially directed erosion, tangentially oriented abrasions in the oil wedge area and abrasion in the sealing zone or group attack. The Sb impregnated hard carbon rings showed uniform or rather deep groove type wear. The analysis shows that the loss of material is preceded by the selective dissolution of the Ni (Co) binder metal or of the Sb impregnation. It is concluded that the use of a NiCrMo binder, or reaction bonded SiC rings, or the substitution of Sb impregnation by synthetic resins should be adopted to reduce the corrosion problem, and that corrosion test procedures should be introduced to monitor quality. Author (ESA)

N83-13468# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
OIL FILM INSTABILITY IN A 320 MW TURBOALTERNATOR BEARING: DIAGNOSIS, CAUSE ANALYSIS AND PROBLEM SOLUTION [INSTABILITA DEL FILMO D'OLIO IN UN CUSCINETTO DI UN TURBOALTERNATORE DA 320 MW: DIAGNOSI, ANALISI DELLE CAUSE E SOLUZIONE DEL PROBLEMA]
A. Clapis, G. L. Lapini, and T. Rossini 1981 26 p refs In ITALIAN Presented at 10th Congr. dell'Assoc. Ital. Manutenzione: Manutenzione e Management, Trieste, Italy, 10-12 Nov. 1981
(Contract ENEL-39/V00)
(CISE-1752) Avail: NTIS HC A03/MF A01

A pressure transducer to measure oil pressure at a particular point of the oil film and two proximity sensors were installed in each of the six bearings of a turboalternator. An electronic differential altimeter, with 0.02 mm vertical displacement measurement precision was also installed. During start-up an excesive level of vibration was detected and the machine was immediatly stopped. The analysis shows a sudden increase of vibration when the oil temperature gets down to 45.2 deg and that it was due to a misalignment of 0.7 mm between the second and third bearing produced during the heat-up of the machine. The alignment was corrected. Author (ESA)

N83-13469# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
MEASUREMENT OF VERTICAL ALIGNMENT VARIATIONS IN WORKING TURBOALTERNATOR SHAFTS [MESURE DES VARIATIONS D'ALIGNEMENT VERTICAL DES PALIERS DE TURBO-ALTERNATEURS EN FONCTIONNEMENT]
A. Clapis, G. Possa, and T. Rossini 1982 30 p refs In FRENCH Presented at Journees d'Etudes sur la Surveillance des Machines en Fonctionnement et Seuils d'Intervention, Paris, 13-14 Jan. 1982
(Contract ENEL-39/V00)
(CISE-1777) Avail: NTIS HC A03/MF A01

The application of an electronic differential altimeter to the measurement of vertical alignment of rotating machinery shafts is discussed. The instrument is based on the communicating vessels principle and measures continuously the vertical displacement with a 10 micrometer precision. In addition, the oil pressure in a significant bearing location is also continuously measured. The instrument was tested for over a year on working turboalternators of up to 660 MW. In several cases it was possible to analyze the causes of incidents, using instrument recording. Two of these cases are described. Author (ESA)

N83-13470# Sydney Univ. (Australia). School of Civil and Mining Engineering.
THE INFLUENCE OF SOIL NON-HOMOGENEITY UPON THE PERFORMANCE OF LIQUID STORAGE TANKS
R. K. Rowe, J. R. Booker, and J. C. Small 1982 39 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada
(PB82-232281; R-406) Avail: NTIS HC A03/MF A01 CSCL 13D

A method to analyze the behavior of a circular tank which rests on a nonhomogeneous crusted soil is described. A substructure wherein a soil flexibility matrix for a nonhomogeneous elastic soil is determined by finite layer analysis. The tank base is analyzed as a circular plate and the tank wall is treated as a circular cylinder. The behavior of the soil, base and tank wall are combined to obtain a set of equations which describes the response of the entire soil structure system. GRA

N83-13471# Sydney Univ. (Australia). School of Civil and Mining Engineering.
THE ANALYSIS OF LIQUID STORAGE TANKS ON DEEP ELASTIC FOUNDATIONS
J. R. Booker and J. C. Small Oct. 1981 52 p refs
Avail: NTIS HC A04/MF A01 CSCL 13D

The behavior of a cylindrical liquid storage tank resting on a deep homogeneous elastic layer is examined. The analysis employs a substructure approach and proceeds by examining the behavior of the tank base, the tank walls and the soil separately and developing flexibility matrices for each of these components. These flexibility matrices are then assembled and the complete soil structure system analyzed. GRA

N83-13472# Kloeckner-Humboldt-Deutz A.G., Cologne (West Germany).
INVESTIGATION INTO THE ENERGY CONSUMED IN COOLING A HIGH PERFORMANCE DIESEL ENGINE AND THE WAY IT CAN BE REDUCED, ESPECIALLY BY HEAT INSULATION
W. Kleinschmidt and W. Rodenbach 1980 96 p refs Transl. into ENGLISH from the GERMAN Original language document announced as 81N-21366
(PB82-211970; BMVG-FBWT-80-2) Avail: NTIS HC A05/MF A01 CSCL 21G

The effects of improved heat insulation on engine operation cycle characteristics, combustion and cooling were investigated. Results indicate that maximum reduction in fuel consumption of 6.5% can be achieved with an ideal insulation; this figure can be improved to about 10% with turbo or Rankine Hybrid engines. However the heat insulation that can be realized in practice together with the combustion difficulties encountered renders this type of engine noncompetitive. Predictions on the thermal loads, fuel consumtions and heat rejection associated with highly turbocharged engines are given. Author (GRA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-13473# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
PRESSURE VESSEL CONTROL DURING HYDRAULIC TEST BY MEANS OF ACOUSTIC EMISSION [CONTROLLO DI CORPI A PRESSIONE IN PROVA IDRAULICA MEDIANTE EMISSIONE ACOUSTICA]
G. Possa and F. Tonolini 1982 12 p In ITALIAN; ENGLISH summary Presented at Conv. sulla Componentistica per gli Impianti Termici: Progettazione-Costruzione-Esercizio-Controlli, Milan, 29 Apr. 1982
(CISE-1785) Avail: NTIS HC A02/MF A01

The main aspects of the nondestructive test technique based on the auscultation of the acoustic emission produced in pressure vessel material during the hydrotest are presented. This technique has already overcome the developmental and testing stages. The aspects of major interest for the industrial use of the technique, such as the measurement instrumentation, the standards of application now available and the use of the information obtained are discussed in detail. Author (ESA)

N83-13474# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
ACOUSTIC EMISSION: APPLICATION TO NUCLEAR COMPONENTS

G. Possa 1982 25 p refs Presented at Intern. Conf. on New Trends in Non-Destructive Testing, Brussels, 24-26 Mar. 1982
(CISE-1791) Avail: NTIS HC A02/MF A01

The state of development of the most important acoustic emission techniques applicable to nuclear power plant operations is reviewed. The applications taken into account refer to hydrotests or proof tests of pressure components, on-line condition monitoring of important components, leak detection, loose part monitoring and mechanism monitoring. The techniques are considered mature as to sensitivity, source location and instrumentation reliability, but further research and development are still needed in signal interpretation. Author (ESA)

N83-13475# Massachusetts Inst. of Tech., Cambridge. Sea Grant College Program.
THERMAL NONDESTRUCTIVE TESTING OF FIBERGLASS USING LIQUID CRYSTALS: A TWO-PART REPORT
James H. Williams, Jr., S. Hossein Mansouri, and Samson S. Lee Dec. 1981 206 p refs
(Grant NA79AA-D-00101)
(PB82-237512; MITSG-81-16; NOAA-82051014) Avail: NTIS HC A10/MF A01 CSCL 14B

Cholesteric liquid crystals were investigated as a thermal medium for identifying fiberglass flaws. A one-dimensional heat transfer model through a laminate with various kinds of interlaminar flaws is described. The effects of flaw thick plotted for a range of variables that model most practical situations. Studies of a fiberglass laminate containing simulated flaws or orthogonal to the surface are reviewed. Various plots on the sensitivity and effectiveness of liquid crystal thermal testing are presented. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N83-13476 Oregon State Univ., Corvallis.
AN AEROELASTIC ANALYSIS OF THE DARRIEUS WIND TURBINE Ph.D. Thesis
Edward Earnest Meyer 1982 161 p
Avail: Univ. Microfilms Order No. DA8224111

The stability of small oscillations of the troposkein-shaped blade used on Darrieus wind turbines is investigated. The blade is assumed to be attached to a perfectly rigid rotor shaft and spinning in still air. Linear equations of motion are derived which include the effects of in-plane, out-of-plane, and torsional stiffness, mass and aerodynamic center offsets, and the aerodynamic wake. Results presented include the free-vibration characteristics of the rotating blade, stability of the blade rotating in air, and the effects of mass density, mass center offset, and stiffness parameters on the flutter rotation rates. All results are presented in dimensionless form, hence apply to a family of blades. Dissert. Abstr.

N83-13477 Columbia Univ., New York.
CREEP BUCKLING OF STRUCTURES Ph.D. Thesis
Fikry Roshdy Botros 1982 126 p
Avail: Univ. Microfilms Order No. DA8222347

A numerical treatment of the problem of creep buckling of structures is presented. The constitutive equations of the material model assumed include the effects of elastic strains, primary and secondary creep strains and creep recovery. They are thus capable of reproducing the material response under non-stationary stress conditions. The strain-displacement relations are in the form valid for large displacement gradients. Finite element formulation is developed for straight and curved beams, plates and shells. The time history of the deformation of these structures is analyzed with the aid of several schemes of integration in time of the equations of the discretized structure. One-step implicit and iterative implicit schemes were tested. For structures with unstable deformation paths (snap-buckling phenomenon), which occur typically in shallow arches and certain types of shells, accurate and efficient description of the motion of the structure is obtained by the inclusion of the inertia forces in an implicit method of integration of the equations of motion. Dissert. Abstr.

N83-13478 Columbia Univ., New York.
CONTINUUM MODELING OF LARGE DISCRETE STRUCTURAL SYSTEMS Ph.D. Thesis
Harold Shrage Fluss 1982 118 p
Avail: Univ. Microfilms Order No. DA8222383

A least square formulation is presented for the modeling of a discrete structural system by an equivalent continuum. The discrete continuum analogy is developed by isolating a unit cell of the structure and then replacing it with a continuum element. The continuum constitutive properties are determined such that they minimize the difference in strain energy between the two systems. This minimization procedure is given both for continuum elements assumed to be in a state of constant strain, as well as for flexural elements in constant curvature. The proposed approach is first applied to the classical elastic continuum modeling of trusses and frames. In the case of trusses, the derived constitutive parameters are verified. For frames, the ability of a classically elastic continuum to model the framed cell behavior is analyzed, and it is shown that classical is overly restrictive. Dissert. Abstr.

N83-13479 Columbia Univ., New York.
ELASTO-PLASTIC BUCKLING AND POST-BUCKLING BEHAVIOR OF STIFFENED PLATES AND BOX GIRDERS Ph.D. Thesis
Lembit Margus Kutt 1982 126 p
Avail: Univ. Microfilms Order No. DA8222421

Plate and beam elements are formulated with the aid of elastoplastic constitutive equations which involve the plate or beam strain components and the plate or beam stress resultants. The compatibility of the plate and the stiffener displacements was achieved by a procedure of 'slaving' the stiffer nodes to the corresponding plate nodes. Arbitrary initial imperfections can be taken into account in the analysis. To deal efficiently with plates with many closely spaced stiffeners, an elasto-plastic orthotropic plate element was developed. The solution of the equations of static deformations with stable equilibrium paths is achieved by the Newton-Raphson method in the 'load factor' version. The problems of dynamic loading and problems of buckling and post-buckling with unstable equilibrium branches are analyzed with the aid of the central difference method of integration in time of the equations of motion. Examples of a stiffened plate and a section of the hull of a tanker analyzed in the elasto-plastic buckling and post-buckling ranges of behavior are given. Dissert. Abstr.

N83-13480 Columbia Univ., New York.
ELASTIC AND INELASTIC CONSTITUTIVE MODELS FOR FABRIC REINFORCED COMPOSITES Ph.D. Thesis
James Oluesgun Thomas 1982 113 p
Avail: Univ. Microfilms Order No. DA8222496

The elastic constitutive model, which accounts for the basic mechanisms of yarn rotation, yarn extension, and coating extension is obtained by expressing the equations of equilibrium for a unit cell of the material in terms of the applied stresses, strains, and fabric geometric and elastic model parameters. A method of determining the model parameter is proposed. Based on the parameters obtained in a single test, theoretical curves are plotted for various biaxial loading states and compared with experimental results. The inelastic constitutive model is obtained by extending the elastic model to include yarn-coating debonding and yarn-coating slippage. The processes of yarn-coating debonding, yarn-coating slippage, and coating extension are modelled by a linear work-hardening coating material. To examine the predictive capability of the model a systematic procedure is developed to determine the relevant model parameters. This procedure is applied to the same set of experimental results used previously and

comparisons are made between experimental results and theoretical predictions. Dissert. Abstr.

N83-13481 Carnegie-Mellon Univ., Pittsburgh, Pa.
SHEAR BANDS IN ELASTIC-PERFECTLY PLASTIC MEDIA Ph.D. Thesis
Ying-Kuo Lee 1982 167 p
Avail: Univ. Microfilms Order No. DA8215887

A direct finite element method for computing shear bands in elastic-perfectly plastic media is presented, such that the mixed elliptic-hyperbolic field can be modeled properly. The numerical solution capability is established for problems of plane strain. The validity of the numerical analysis is demonstrated by consideration of a number of fundamental problems for which analytic solutions are available. A rational procedure for the determination of appropriate weight functions is presented in order to solve a crack problem. The numerical computations are performed on a compact specimen. The elastic cases serve as a check of the method's ability by comparison of analytic solutions. The results are considered to be superior to that from the ordinary finite element method. The elastic-plastic cases show that the initiation and growth of shear bands is well captured and provide some insight into the elastic-perfectly plastic behavior of a compact specimen. The results are strongly supported by Knott's experimental work. Dissert. Abstr.

N83-13482 Stanford Univ., Calif.
PROBLEMS IN LARGE DEFORMATION ELASTO-PLASTIC ANALYSIS USING THE FINITE ELEMENT METHOD Ph.D. Thesis
Ted B. Wertheimer 1982 211 p refs
Avail: Univ. Microfilms Order No. DA8220560

Anisotropic behavior induced by kinematic hardening is examined. The stress analysis at finite deformation accounts for the effect of rotation by using Jaumann derivatives based on the spin in both the evolution equation for the shift tensor (which represents the induced anisotropy) and in the flow type constitutive equation. This analysis generates the unexpected results that oscillatory shear stress are predicted for monotonically increasing simple shear strain. By defining a modified Jaumann rate based on the angular velocity of certain directions embedded in the body which characterize the anisotropic nature of the material, a method of stress analysis is implemented which eliminates the inconsistency and yields a monotonically increasing shear stress. Solutions are presented comparing different hardening models for the extrusion, upsetting and the Olson cup problems. Dissert. Abstr.

N83-13483 Georgia Inst. of Tech., Atlanta.
ANALYSIS OF LARGE QUASISTATIC DEFORMATIONS OF INELASTIC SOLIDS BY A NEW STRESS BASED FINITE ELEMENT METHOD Ph.D. Thesis
Kenneth Wayne Reed 1982 255 p
Avail: Univ. Microfilms Order No. DA8221816

A hybrid stress finite element algorithm suitable for analyses of large quasistatic deformations of inelastic solids is presented. Principal variables in the formulation are the nominal stress rate and spin. The finite element equations which result are discrete versions of the equations of compatibility and angular momentum balance. Consistent reformulation of the constitutive equation, and accurate and stable time integration of the stress are discussed at length. Examples which bring out the feasibility and performance of the algorithm conclude the work. Dissert. Abstr.

N83-13484 Virginia Polytechnic Inst. and State Univ., Blacksburg.
OPTIMAL CONTROL OF A ROTATING CYLINDER PARTIALLY FILLED WITH IDEAL FLUID Ph.D. Thesis
Robert Douglas Klauber 1982 193 p
Avail: Univ. Microfilms Order No. DA8220659

Optimal control theory analysis is applied to a rotating cylinder partially filled with an inviscid, incompressible fluid. Two models of the system are investigated: a two discrete mass system with fluid inside one mass and the control force applied to the other, and a continuously distributed cylindrical mass system with control force applied to a discrete lower suspension mass. For the second system the method of assumed models is used to discretize the system and obtain a set of n linear algebraic equations. In both cases the treatment is two dimensional and axial motion of the fluid is considered negligible. In both models, the uncontrolled system, shown by earlier researchers to be inherently unstable, is found to be controllable. The appropriate optimal feedback control is derived and system responses investigated. Both models are shown to be observable. Direct measurement of only a portion of the components of the state vector is sufficient, using a Luenberger Observer, to estimate the entire state vector. Dissert. Abstr.

N83-13485 Columbia Univ., New York.
THIRD STAGE CREEP AND CREEP FRACTURE Ph.D. Thesis
Alan Joseph Levy 1982 139 p
Avail: Univ. Microfilms Order No. DA8222428

The tensile behavior of metal bars at elevated temperatures is considered with emphasis on: (1) the geometric effect of reduced cross section of the bar at increasing longitudinal strain; (2) the effect of nonuniform strain (necking) in an initially cylindrical specimen; and (3) the effect of material deterioration (damage) due to creep. A system of constitutive equations capable of describing the basic creep phenomena (elastic strain, first and second stage creep, creep recovery) in the range of small strains is used. A generalization of these equations to large strains is then postulated, and analytical and numerical methods of predicting the creep behavior of tensile specimens up to fracture are developed. The problem of creep necking is treated as a bifurcation problem of deformation of an initially perfectly cylindrical bar and as a problem of response of a bar with initial imperfections of its geometry. The results indicate that any of the above effects is capable of explaining the general form of the third stage of the creep curve and the subsequent fracture. Dissert. Abstr.

N83-13486 Cincinnati Univ., Ohio.
ON THE DYNAMICS OF FLEXIBLE MULTIBODY SYSTEMS Ph.D. Thesis
Frederick Allan Kelly 1982 141 p
Avail: Univ. Microfilms Order No. DA8223052

The governing equations for flexible multibody systems are formulated recursively. The chain system consists of N flexible bodies in an arbitrary tree structure provided that no closed loops are formed and translation is permitted between adjoining bodies. A systematic method for handling the geometry and kinematics is presented. The equations of motion are then developed using Kane's dynamical equations. The equations form a set of 13N nonlinear ordinary differential equations. An application of the general theory to linear chains is developed and application is made to the analysis of flexibility in industrial robotic manipulators. A computer procedure, DYNAFLEX, was written and applied to an industrial robot. The cases studied are static deflections, quasi-static deflections and dynamic deflections of the manipulator as it executes a programmed motion. Dissert. Abstr.

N83-13487 Cincinnati Univ., Ohio.
ON THE DYNAMICS OF CONSTRAINED MULTIBODY SYSTEMS Ph.D. Thesis
James William Kamman 1982 183 p
Avail: Univ. Microfilms Order No. DA82223050

The governing equations for constrained multibody systems are formulated in a manner suitable for their automated, numerical development and solution. Specifically, the 'closed loop' problem of multibody chain systems are addressed. The governing equations are developed by modifying dynamical equations obtained from Lagrange's form of d'Alembert's principle. This modification, which is based upon a solution of the constrant equations through a 'zero eigenvalues thoerem,' is in effect a contraction of the dynamical equations. The analysis given herein is most effectively used on large systems with many degrees of freedom. Toward this end, a computer program UOIN-DYNOCOMBS was written which formulates and numerically integrates the governing equa-

tions. The program, and hence the analytical developments, were tested with a few example problems. Dissert. Abstr.

N83-13488 Rensselaer Polytechnic Inst., Troy, N. Y.
A VISCOPLASTIC ANALYSIS OF THE INFLUENCES OF TIME AND LOADING RATE ON CRACKED STRUCTURES Ph.D. Thesis
Mark Michael Little 1982 151 p
Avail: Univ. Microfilms Order No. DA8223328

The theory of viscoplasticity based on total strain and over stress was developed to model the observed time dependent deformation of structural metals at room temperature and quasistatic loading rates. Based on experimental evidence, inelastic compressibility was incorporated in the original theory. A modified version of the theory which models inelastic compressibility effects including inelastic incompressibility is presented. Results of numerical analyses using the modified theory are reviewed and compared to experimental data. The experimental results are best reproduced when a modest degree of inelastic compressibility is assumed. The modified theory is incorporated in a finite element scheme whose accuracy is demonstrated by means of some simple examples. The finite element approach with the modified viscoplasticity theory is then used to examine the influences of time and loading rate on cracked structures. In all of the analyses the material properties of annealed AISI Type 304 Stainless steel are employed. Dissert. Abstr.

N83-13489 Rensselaer Polytechnic Inst., Troy, N. Y.
NONLINEAR THERMOELASTIC EFFECTS IN SURFACE MECHANICS Ph.D. Thesis
Joseph M. Pitkin 1982 324 p
Avail: Univ. Microfilms Order No. DA8223333

A study is made of the governing equations of the nonlinear thermoelastic theory, with consideration given to both large deformations and temperature dependence of material parameters. The main objective is to ascertain the importance of certain coupling terms usually neglected, with a view toward eliminating discrepancies between theory and experiment and aiding the interpretation of experimental results. Particular attention is given to high-speed sliding contact situations, for which high temperatures can become localized near the contact surface, thus contributing to the significance of the coupling terms in this region. An iterative finite difference scheme is developed, guided by the above considerations and incorporating the known features of the boundary layer. A typical contact situation is analyzed, utilizing a rectangular finite difference grid with variable grid line spacing and 340 grid points. The results of direct searches for the 1020 temperatures and displacements comprising the solution are discussed. Additional development necessary to improve the search efficiency is initiated and future objectives aimed at extending the analysis are outlined. Dissert. Abstr.

N83-13490 Duke Univ., Durham, N. C.
A DISCRETE MODEL FOR NONLINEAR STRUCTURAL DYNAMICS OF ROTATING CANTILEVERS Ph.D. Thesis
Mchamed El-Essawi 1982 262 p
Avail: Univ. Microfilms Order No. DA8221143

A general geometrically nonlinear discrete mathematical model governing the dynamic behavior of a rotating cantilever with initial geometric imperfections, and with arbitrary orientation with repect to the axis of rotation is developed in this study. The model consists of a set of second order quasi-linear ordinary differential equations of motion for coupled axial-bending-bendng-torsion deformations. The erivation of the model is based on the extened Hamilton principle for elastodynamics. In the functional second degree nonlinear strain-displacement and velocity-displacement are used, and the material is assumed linearly elastic. The Rayleigh-Ritz method, in conjunction with any admissible solution in terms of undetermind functions of time and known yet unspecified coordinate functions of space, is systematically introduced to discretize the energy density expressions. The coefficients involved in this discretization process are obtained in a structured form suitable for computer implementation. Dissert. Abstr.

N83-13491*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
DOUBLE NODING TECHNIQUE FOR MIXED MODE CRACK PROPAGATION STUDIES
B. M. Liaw, A. S. Kobayashi, and A. F. Emergy 1982 22 p refs (Grant NGL-48-002-004)
(NASA-CR-169535; NAS 1.26:169535) Avail: NTIS HC A02/MF A01 CSCL 20K

A simple dynamic finite element algorithm for analyzing a propagating mixed mode crack tip is presented. A double noding technique, which can be easily incorporated into existing dynamic finite element codes, is used together with a corrected J integral to extract modes I and II dynamic stress intensity factors of a propagating crack. The utility of the procedure is demonstrated by analyzing test problems involving a mode I central crack propagating in a plate subjected to uniaxial tension, a mixed mode I and II stationary, slanted central crack in a plate subjected to uniaxial impact loading, and a mixed mode I and II extending, slanted single edge crack in a plate subjected to uniaxial tension. Author

N83-13492# McGill Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
FLOW-INDUCED VIBRATION OF CYLINDRICAL STRUCTURES: A REVIEW OF THE STATE OF THE ART
M. P. Paidoussis Aug. 1982 26 p refs Proposed for presentation at the 2nd Intern. Topical Meeting on Nucl. Reactor Thermohydraulics, Santa Barbara, Calif., 11-14 Jan. 1983; sponsored by American Nuclear Society, ASME and the American Inst. of Chemical Engineers
(MERL-82-1) Avail: NTIS HC A03/MF A01

Two classes of vibration problems encountered in reactors and reactor peripherals are considered: vibration of cylindrical structures induced by cross flow and by axial flow. A historical perspective is given, in which the milestone contributions that advanced the state of the art are highlighted. Developments in the last decade are discussed with emphasis on those in the last three years. The state of understanding of the fluidelastic mechanisms involved, on the one hand, and of predictive tools available to the designer, on the other are assessed. Author

N83-13493*# Martin Marietta Aerospace, Denver, Colo.
STRUCTURAL DYNAMICS PAYLOAD LOADS ESTIMATES Interim Report
R. C. Engels Aug. 1980 103 p refs
(Contract NAS8-33556)
(NASA-CR-170679; NAS 1.26:170679; MCR-80-553) Avail: NTIS HC A06/MF A01 CSCL 20K

Present analytical techniques by which design loads are predicted are very costly and time consuming. Chapter I presents the standard techniques used to analyze payload/booster systems. They are full scale methods in the sense that they all require the solution of the coupled equations of motion of the payload/booster system. Chapter II identifies several short cut methodologies. These already existing techniques do not require the solution of the coupled system equations. The potentials and shortcomings of each of these methods are discussed. Chapter III covers the favored methods accompanied by recommendations for further development, refinement, and demonstrations. An outline of a new approach is also included. L.F.M.

N83-13494*# Martin Marietta Aerospace, Denver, Colo.
STRUCTURAL DYNAMICS PAYLOAD LOADS ESTIMATES Interim Report
R. C. Engels Aug. 1981 43 p refs
(Contract NAS8-33556)
(NASA-CR-170680; NAS 1.26:170680; MCR-81-602) Avail: NTIS HC A03/MF A01 CSCL 20K

The development of a full scale payload integration method which reduces the cost of a load cycle and is capable of land long very large systems is discussed. The method solves the coupled booster/payload system equations and does not involve additional approximations as compared to the standard transient

analysis. The method is cost effective and directly applicable to the shuttle payload design case. E.A.K.

N83-13495*# Martin Marietta Aerospace, Denver, Colo.
STRUCTURAL DYNAMICS PAYLOAD LOADS ESTIMATES Final Report
R. C. Engels Sep. 1982 146 p refs
(Contract NAS8-33556)
(NASA-CR-170681; NAS 1.26:170681; MCR-82-601) Avail: NTIS HC A07/MF A01 CSCL 20K

Methods for the prediction of loads on large space structures are discussed. Existing approaches to the problem of loads calculation are surveyed. A full scale version of an alternate numerical integration technique to solve the response part of a load cycle is presented, and a set of short cut versions of the algorithm developed. The implementation of these techniques using the software package developed is discussed. J.D.

N83-13496*# Martin Marietta Aerospace, Denver, Colo.
STRUCTURAL DYNAMICS PAYLOAD LOADS ESTIMATES: USER GUIDE Final Report
T. G. Shanahan and R. C. Engels Sep. 1982 179 p refs
(Contract NAS8-33556)
(NASA-CR-170682; NAS 1.26:170682; MCR-82-602) Avail: NTIS HC A09/MF A01 CSCL 20K

This User Guide with an overview of an inegration scheme to determine the response of a launch vehicle with multiple payloads. Chapter II discusses the software package associated with the integration scheme together with several sample problems. A short cut version of the integration technique is also discussed. The Guide concludes with a list of references and the listings of the subroutines. L.F.M.

N83-13497*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GEOMETRICALLY NONLINEAR ANALYSIS OF ADHESIVELY BONDED JOINTS
B. Dattaguru, R. A. Everett, Jr., J. D. Whitcomb, and W. S. Johnson Sep. 1982 29 p refs Presented at the 23rd AIAA/ASME/ASCE/AHS Structures, Structural Dyn., and Mater. Conf., New Orleans, 10-12 May 1982 Submitted for publication
(NASA-TM-84562; NAS 1.15:84562) Avail: NTIS HC A03/MF A01 CSCL 20K

A geometrically nonlinear finite element analysis of cohesive failure in typical joints is presented. Cracked-lap-shear joints were chosen for analysis. Results obtained from linear and nonlinear analysis show that nonlinear effects, due to large rotations, significantly affect the calculated mode 1, crack opening, and mode 2, inplane shear, strain-energy-release rates. The ratio of the mode 1 to mode 2 strain-energy-relase rates (G1/G2) was found to be strongly affected by he adhesive modulus and the adherend thickness. The ratios between 0.2 and 0.8 can be obtained by varying adherend thickness and using either a single or double cracked-lap-shear specimen configuration. Debond growth rate data, together with the analysis, indicate that mode 1 strain-energy-release rate governs debond growth. Results from the present analysis agree well with experimentally measured joint opening displacements. Author

N83-13498*# Boeing Aerospace Co., Seattle, Wash. Engineering Technology.
TEST AND ANALYSIS OF CELION 3000/PMR-15, GRAPHITE/POLYIMIDE BONDED COMPOSITE JOINTS: DATA REPORT
J. B. Cushman, S. F. McCleskey, and S. H. Ward Hampton, Va. NASA. Langley Research Center Jul. 1982 356 p refs
(Contract NAS1-15644)
(NASA-CR-165956; NAS 1.26:165956) Avail: NTIS HC A16/MF A01 CSCL 20K

Standard single lap, double lap and symmetric step lap bonded joints of Celion 3000/PMR-15 graphite/polyimide composite were evaluated. Composite to composite and composite to titanium joints were tested at 116 K (-250 F), 294 K (70 F) and 561 K (550 F). Joint parameters evaluated are lap length, adherend thickness, adherend axial stiffness, lamina stacking sequence and adherend tapering. Advanced joint concepts were examined to establish the change in performance of preformed adherends, scalloped adherends and hybrid systems. The material properties of the high temperature adhesive, designated A7F, used for bonding were established. The bonded joint tests resulted in interlaminar shear or peel failures of the composite and there were very few adhesive failures. Average test results agree with expected performance trends for the various test parameters. Results of finite element analyses and of test/analysis correlations are also presented. E.A.K.

N83-13499*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FINITE-ELEMENT ANALYSIS OF INITIATION, STABLE CRACK GROWTH AND INSTABILITY USING A CRACK-TIP-OPENING DISPLACEMENT CRITERION
J. C. Newman, Jr. Oct. 1982 56 p refs Presented at the ASTM 15th Natl. Symp. on Fracture Mech., College Park, Md., 7-9 Jul. 1982
Avail: NTIS HC A04/MF A01 CSCL 20K

An elastic-plastic (incremental and small strain) finite element analysis was used with a crack growth criterion to study crack initiation, stable crack growth, and instability under monotonic loading to failure of metallic materials. The crack growth criterion was a critical crack-tip-opening displacement (CTOD) at a specified distance from the crack tip, or equivalently, a critical crack-tip-opening angle (CTOA). Whenever the CTOD (or CTOA) equaled or exceeded a critical value, the crack was assumed to grow. Single values of critical CTOD were used in the analysis to model crack initiation, stable crack growth, and instability for 7075-T651 and 2024-T351 aluminum alloy compact specimens. Calculated and experimentally measured CTOD values at initiation agreed well for both aluminum alloys. These critical CTOD values were also used to predict failure loads on center-crack tension specimens and a specially-designed three-hole-crack tension specimen made of the two aluminum alloys and of 304 stainless steel. All specimens were 12.7 mm thick. Predicted failure loads for 7075-T651 aluminum alloy and 304 stainless steel specimens were generally within + or - 15 percent of experimental failure loads, whereas the predicted failure loads for 2024-T351 aluminum alloy specimens were generally within + or - 5 percent of the experimental loads. M.G.

N83-13500# National Aerospace Lab., Tokyo (Japan).
ELASTIC AND ELASTO-PLASTIC STRESS ANALYSIS OF THE STANDARD COMPACT TENSION SPECIMEN
Hiroyuki Terada 1982 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-712; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Stress intensity factor and crack opening displacement, both at loading line and edge line, of the standard compact tension specimen were calculated by elastic stress analysis using the bounday collocation technique. Plastic zone size and crack tip opening displacement for the practical range of loading level and crack ratio in the fracture toughness testing were also obtained from elasto-plastic analysis based on the Dugdale model concept. The effect of plastic deformation at crack tip on the crack opening displacement obtained at loading line and edge were examined using nondimensional factors in the diagrams. Comparison was made with available results for the elastic analysis. S.L.

N83-13501# National Aerospace Lab., Tokyo (Japan).
ACOUSTIC EMISSION TECHNIQUE APPLIED TO CFRP SPAR/RIB ELEMENT MODEL
Yoichi Hayashi, Yoshiaki Kakuta, and Eiichi Nakai 1982 20 p refs
(NAL-TR-707; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Acoustic Emission is a very attractive and promising technique monitoring incipient failure of brittle structures. Acoustic emission data in an attempt to understand the fracture behaviour of the CFRP Spar/Rib model. In fatigue tests, it is found that sudden increase in a rate count and the rate of total count (counts/400 load cycles) presages final failure. Author

N83-13502# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
PHOTOELASTIC INVESTIGATION OF THE DOUBLE TORSION SPECIMEN
B. Hindin Aug. 1982 31 p refs
(Contract N00014-75-C-1012; NR Proj. 036-091)
(AD-A119135) Avail: NTIS HC A03/MF A01 CSCL 20/11

The stress distribution of the double-torsion fracture mechanics specimen geometry is presented using a photoelastic frozen stress technique. Isochromatic fringes of a plastic double-torsion specimen under load were photographed and analyzed in the top, middle and bottom planes parallel to the top surface. Principal stress directions for these planes are also given. The relative magnitudes of the principal stresses perpendicular to the crack plane at the crack tip, crack origin and a point midway between the origin and crack tip are shown. Author (GRA)

N83-13503# Naval Research Lab., Washington, D. C.
EFFICIENT ELASTIC DESIGN OF SMALL FOUNDATIONS
George J. OHara and Patrick F. Cunniff 13 Sep. 1982 13 p ref (SF43400001)
(AD-A119343; NRL-MR-4886) Avail: NTIS HC A02/MF A01 CSCL 12/1

An elastic design analysis method is presented for small foundations which utilize an energy criteria. It provides a direct approach for calculating allowable loads and for estimating the design efficiency of the resulting structure. The method has the advantage of circumventing the standard method for single degree of freedom systems in first calculating the fixed base frequency, utilizing shock design spectra, and equivalent static load analyses. A sample problem is presented that shows how to establish maximum allowable equipment weight for a shock. The results are worked up in some detail to show the ease of application of this method. Author (GRA)

N83-13504# Sandia Labs., Albuquerque, N. Mex.
CONTACT STRESSES ON A THIN PLATE AFTER LARGE DISPLACEMENTS TO A FULL PARABOLIC SURFACE
R. C. Reuter, Jr. and R. K. Wilson Dec. 1981 26 p refs
(Contract DE-AC04-76DP-00789)
(DE82-005712; SAND-81-2083) Avail: NTIS HC A03/MF A01

A solution is obtained for the determination of all loads necessary to hold an initially flat, thin, elastic plate in the shape of a prescribed parabolic surface, following large displacement. These loads include spatially varying normal tractions distributed over the back surface of the plate, and a uniform shear force and bending moment applied along the opposing edges which become the rims of the parabola after deformation. The plate represents a reflective surface which is mechanically deformed to the shape of, and bonded to a rigid, parabolic substructure to create a solar collector. After assembly, the normal stresses are those developed in the adhesive which bonds the reflective surface to the substructure. The absence of edge loads along the rims of an actual, formed reflective surface gives rise to local displacement and stress variations (edge effects) which are obtained through a separate solution. Numerical results for the normal stress distribution, local variations and loss of optical quality in the edge effect zone are included. DOE

N83-13505# Commissariat a l'Energie Atomique, Montrouge (France). Centre d'Etudes de Bruyeres-le-Chatel.
STABLE PROPAGATION OF NONCROSSING CRACKS IN A MARAGING STEEL [PROPAGATION STABLE DE FISSURES NON TRAVERSANTES DANS UN ACIER MARAGING]
A. Leduff (Univ. de Technologie de Compiegne), D. Francois (Univ. de Technologie de Compiegne), J. L. Castagne, D. Miannay, and P. LePoac Apr. 1981 11 p refs In FRENCH Presented at the 5th Intern. Conf. on Fracture, Cannes, France, 29 Mar. - 4 Apr. 1981
(CEA-CONF-5675; CONF-810373-6) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The propagation of nontransversing semielliptical fatigue cracks in maraging steel plates was studied. It was found that the propagation could be correctly described with the PARIS law and values calculated for K along the crack front. Stable propagation under a uniform load was studied. The instability of a nontransvering crack can be predicted using an equivalent transversing crack and the R curve, the length of this equivalent transversing crack is related to the shape of the nontransvering crack by an empirical formula. DOE

N83-13506# Commissariat a l'Energie Atomique, Paris (France). Service Metallurgie.
FRACTURE INITIATION OF METALS AT HIGH LOADING RATES
R. Dormeval, J. M. Chevallier, and M. Stelly Apr. 1981 8 p refs Presented at the 5th Intern. Conf. of Fracture, Cannes, France, 29 Mar. - 3 Apr. 1981
(CEA-CONF-5676; CONF-810373-5) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A new experimental procedure which allows the determination of the fracture parameters of metals at very high loading rates is presented. Using stress was loading, a tensile stress pulse is applied on a notched precracked bar providing the rupture. By recording load time and crack opening displacement time variations K sub (Ic) (for brittle materials) of J sub (Ic) (for ductile materials) are determined. Results on a 35 NCD 16 steel are presented. DOE

N83-13507# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Dept. de Technologie.
HOLD TIME EFFECTS ON LOW CYCLE FATIGUE PROPERTIES OF 316 L STAINLESS STEEL AT 600 DEG C AND 650 DEG C
B. Rezgui, P. Petrequin, and M. Mottot Apr. 1981 10 p refs Presented at the 5th Intern. Conf. on Fracture, Cannes, France, 29 Mar - 3 Apr. 1981
(DE81-700659; CEA-CONF-5741; CONF-810373-7) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Completely reversed (strain) controlled push-pull fatigue tests were conducted on 316 L type steel in air 600 deg C and 650 deg C. The effects of hold time imposed on tensile strain was investigated at different strain levels and a pronounced decrease in fatigue life was observed. For each temperature the importance of this effect depended on the length of hold time and on the strain amplitude. At 600 deg C results showed a continuous reduction in fatigue life with increasing hold time while a saturation effect was observed in tests at 650 deg C. Extensive microstructural damage was seen on the majority of specimens subjected to hold time strain cycling; the changes were similar in the material at both temperatures but differing more in degree than in nature. For continuous cycling the fracture occurred by initiation and propagation of a transgranular crack. For tests with hold time, creep damage in material was produced during periods of tensile stress relaxation leading to intergranular cracking. DOE

N83-13508# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Dept. de Technologie.
METHOD OF ESTIMATION OF THE INTERACTION FATIGUE-CREEP IN INELASTIC ANALYSIS [UNE METHODE DESTIMATION DELINTERACTION FATIQUE-FLUAGE EN ANALYSE INELASTIQUE]
Michel Weisz, Pierre Petrequin, Brahim Rezgui, and Jean Tortel May 1981 17 p refs In PORTUGUESE Presented at the Intern. Conf. on Mech. Behaviour and Nucl. Appl. of Stainless Steel at Elevated Temp., Varese, Italy, 20-22 May 1981
(DE81-700658; CEA-Conf-5728; CONF-8105126-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The effect of hold time on low cycle fatigue resistance of stainless steel-316 L is studied particularly when hold time occurs at the maximal tensile stress of the cycle. Experimental determination, at least when the stress is maintained for a long period of time (over 100 hrs) is difficult. The effect of hold time on the low cycle fatigue curve between 450 to 600 C, is determined. Comparison with experiments are made when possible and are used for design criteria. DOE

N83-13509# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
MODEL FOR PREDICTING NONLINEAR CRACK GROWTH CONSIDERING LOAD SEQUENCE EFFECTS (LOSEQ)
H. Fuehring 1982 102 p refs In GERMAN; ENGLISH summary (LBF-FB-162(1982); ISSN-0721-5320) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 85

An analytical model for predicting nonlinear crack growth is presented which takes into account the retardation as well as the acceleration effects due to irregular loading. It considers not only the maximum peak of a load sequence to effect crack growth, but also all other loads of the history, according to a generalized memory criterion. Comparisons between crack growth predicted by using the LOSEQ-program and experimentally observed data are presented. Author (ESA)

N83-13510# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
COMPARISON OF FATIGUE TESTS FOR DIFFERENT LOADING SEQUENCES WITH THE AID OF THE RELATIVE-MINER-RULE
A. Buch (Technion - Israel Inst. of Tech.), H. Lowak, and D. Schuetz 1982 74 p refs In GERMAN; ENGLISH summary (LBF-TB-164/82; ISSN-0721-5320) Avail: NTIS HC A04/MF A01

The relative-miner-rule was applied for comparision of test results obtained in different laboratories with not fully identical loading spectra on notched specimens, pin-lug joints, and riveted joints. It is shown that the relative-miner-rule takes into account the effect of the loading spectrum modification in the case when the corresponding loading frequency distributions have nearly identical maximal loading distributions. The relative-miner-rule results in a better life prediction than the conventional miner-rule. A conversion with aid of the relative-miner-rule of test results for joints in comparable fatigue life parameters, e.g., number of flights for a common loading frequency distribution, is possible if the S-N lines of the joints are experimentally established.
Author (ESA)

N83-13511# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
FATIGUE LIFE REDUCTION CAUSED BY SURFACE ROUGHNESS INSIDE BOLT HOLES
Aake Magnusson Jun. 1982 32 p refs
(Contract FMV-F-K-82223-78-003-21-001)
(FFA-TN-1982-13) Avail: NTIS HC A03/MF A01

The difference in fatigue life between perfectly reamed bolt holes, i.e., those with maximum roughness height (R max) < 4 microns, and worst acceptable bolt hole (R max = 12 microns) was studied. The influence of scratches (R max = 30 to 60 microns) was also studied. Aluminum joint specimens were subjected to loading, using the FALSTAFF flight load spectrum at a gross area stress = 234 MPa. Holes with R max < 4 microns and R max 12 microns do not show any significant difference in fatigue life. Surface irregularities of this order of magnitude do not act as crack starters. For reamed holes, cracks are initiated at inclusions in the bore of the hole. Axial scratches with R max = 30 to 60 microns reduce fatigue life. Expanded holes are less sensitive to surface roughness than reamed holes. The detrimental effect of scratches is most pronounced for reamed holes at large load transfer. For double shear large load transfer specimens, scratches reduce fatigue life by a factor of 7. Author (ESA)

N83-13512# Rolls-Royce Ltd., Derby (England).
INVESTIGATION OF THE RATE OF PROPAGATION AND SHAPE OF CRACKS IN HIGH STRENGTH STEEL IN CASE OF CYCLIC BENDING
S. Kocanda and A. Likowski Nov. 1981 38 p refs Transl. into ENGLISH from Mech. Teoret. i Stos. (Poland), v. 4, no. 17, 1979 p 603-622
(PNR-90136; Trans-15985; TLT-00851) Avail: NTIS HC A03/MF A01

Crack propagation and crack front shape in 20G2ANBY steel was investigated under cyclic tensile stretching and tensile compression loading. The course of cracking is irregular, particularly in the initial stages. A good correlation between the results of the determination of the rate of cracking by direct observation of changes in the length of cracks on the surface of the specimens and the rates determined indirectly using values of interstriational distances is obtained. The crack front of elements with semielliptical slits, subjected to flat bending, retains its elliptical shape. Microfractographic studies along three directions of crack development in specimens with semielliptical slits show that the cracking rate in the direction perpendicular to the plane of bending has the smallest value. The striations remain perpendicular to the directions of cracking over the entire fracture surface. Author (ESA)

N83-13513# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
EXPERIMENTAL METHOD FOR CREEP MEASUREMENT IN NUCLEAR REACTOR PRESSURE TUBES
G. DeGiorgi, A. Panizzari, and A. Squilloni 1981 12 p refs In ITALIAN; ENGLISH summary Presented at 9th Conv. Nazl. dell'Assoc. Ital. per Anal. delle Sollecitazioni, Trieste, Italy, 23-26 Sep. 1981
(Contract CNEN-AG-6)
(CISE-1740) Avail: NTIS HC A02/MF A01

An experimental method for the measurement of the tangential creep of the pressure tubes of a reactor power channel is described. The experimental equipment is provided with a very sensitive optical transducer probe for diameter measurements, which makes it possible to carry out the continous inspection of the whole pressure tube. The results of the inspections of the ESSOR reactor channel CART-2 of the Ispra CCR-Euratom Centre are reported.
Author (ESA)

N83-13514# Technion - Israel Inst. of Tech., Haifa. Energy Engineering Center.
STRESSES AND DISPLACEMENTS IN A ROTATING SKEW-FACED DISK
J. J. Blech and M. Hershkovitz Mar. 1982 45 p refs
(PB82-239880; EEC-123) Avail: NTIS HC A03/MF A01 CSCL 20K

An analytical solution is presented for the stresses and displacements in a thin isotropic, non-axisymmetric disk rotating with a constant angular velocity. The asymmetry is such that the disk faces are skewed and therefore the disk thickness changes in the circumferential and the radial directions. GRA

N83-13515# National Bureau of Standards, Washington, D.C.
ULTRASONIC MEASUREMENTS OF TITANIUM ELASTICITY AND ATTENUATION IN WELDS AND PLATE Final Report
G. V. Blessing May 1982 17 p refs Sponsored in part by ONR
(PB82-221672; NBSIR-82-2500) Avail: NTIS HC A02/MF A01 CSCL 14B

Ultrasonic shear and longitudinal waves were used to evaluate the elasticity and attenuation of titanium weld and plate alloy. Wave speeds are used to measure the materials' elasticity and anisotropy, and the wave amplitude is used to measure relative levels of scattering in the weld and plate regions. Results obtained on a representative weld are compared with results obtained on oxygen contaminated specimens. GRA

N83-13287# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
NONLINEAR ANALYSIS OF BEAMS. PART 2: FINITE ELEMENT METHODS
M. Sathyamoorthy *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 9 Sep. 1982 p 7-18 refs (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

N83-13288# Portland State Univ., Oreg. Dept. of Mechanical Engineering.
CURRENT METHODS FOR ANALYZING DYNAMIC CABLE

RESPONSE, 1979 TO THE PRESENT
H. Migliore and R. L. Webster *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 4, No. 9 Sep. 1982 p 19-24 refs (For primary document see N83-13285 04-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

42 GEOSCIENCES (GENERAL)

N83-13516# Oak Ridge National Lab., Tenn.
BIOMEDICAL AND ENVIRONMENTAL SCIENCES PROGRAMS AT THE OAK RIDGE NATIONAL LABORATORY
Elizabeth L. Preston, comp. and John A. Getsi, comp. Jul. 1982 69 p
(Contract W-7405-eng-26)
(DE82-019897; ORNL/TM-8448) Avail: NTIS HC A04/MF A01

A major objective of the biomedical and environmental sciences research at the Oak Ridge National Laboratory is to provide information on environmental, health, and safety considerations that can be used in the formulation and implementation of energy technology decisions. Research is directed at securing information required for an understanding of both the short- and long-term consequences of the processes involved in new energy technologies. Investigation of the mechanisms responsible for biological and ecological damage caused by substances associated with energy production and of repair mechanisms is a necessary component of this research. The research is carried out by the staff of four divisions and one program: Biology Division, Environmental Sciences Division, Health and Safety Research Division, Information Division, and the Life Sciences Synthetic Fuels Program. Research programs underway in each of these divisions are discussed. Information on the following subjects is also included: interactions with universities; interactions with industry; technology transfer; recent accomplishments in the areas of program, publications, awards, and patents; and new initiatives.
DOE

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N83-13517 Iowa State Univ. of Science and Technology, Ames.
REMOTE SENSING OF LAND RESOURCES: APPLICATION OF LANDSAT SATELLITE IMAGERY Ph.D. Thesis
Jahanshir Golchin 1982 197 p
Avail: Univ. Microfilms Order No. DA8221189

LANDSAT satellite images were used to study the major factors which affect water consumption by irrigation in west-central Iowa. These factors are soil moisture, area under irrigation, and crop types. Once the monitoring system of these factors is established, the amount of water withdrawn for supplementary irrigation can be estimated. The use of the microdensitometer and measurement of image reflectivity was emphasized in the soil moisture portion. The results indicated that there is a linear relation between the measured reflectivity from the LANDSAT image and the generalized surface oil moisture. Applying a simple manual interpretation method of black and white and false color composite prints and transparencies, both irrigated lands and crop types were identified. The main instrument used in this part was the Zoom Transfer Scope. The results for both experiments were promising and supported the methods of interpretation. Examination of the methods introduced in this study showed that the manual interpretation of LANDSAT imagery is a low-cost and easy approach to monitor the irrigated areas and the crop types. Dissert. Abstr.

N83-13518 Bayerische Akademie der Wissenschaften, Munich (West Germany).
PASS POINT DETERMINATION AND GEOMETRICAL PRECISION OF THE RELATIVE RECTIFICATION OF SCANNER DATA Ph.D. Thesis - Karlsruhe Univ., West Germany [PASSPUNKTBESTIMMUNG UND GEOMETRISCHE GENAUIGKEIT BEI DER RELATIVEN ENTZERRUNG VON ABTASTDATEN]
Walter Joachim Wiesel 1981 74 p refs In GERMAN
(Ser-C-268; ISBN-3-7696-93205; ISSN-0065-5325) Copyright. Avail: Issuing Activity

An iterative method for the relative geometrical rectification of image scanning data, based on pass points, was developed and tested on three data processing systems of an airborne multispectral scanner. The pass points were determined by means of correlation methods. A testing system using the original image data, for the coordinate measuring accuracy obtained by cross correlation, is proposed. The accuracy limits of 0.10 to 0.25 image elements calculated with this testing system, are nearly obtained with the rectification method. Average coordinate errors of 0.15 to 0.27 image elements are obtained on correlation points. These accuracies are sufficient to fit data of different times and/or different sensors into each other. Author (ESA)

N83-13519*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
USE OF LANDSAT IMAGES TO STUDY CERRADO VEGETATION [UTILIZACAO DE IMAGENS ORBITAIS DO SATELITE LANDSAT PARA ESTUDO DA VEGETACAO DE CERRADO]
Nelson de Jesus Parada, Principal Investigator and Pedro Hernandez Filho Aug. 1982 6 p refs In PORTUGUESE; ENGLISH summary Presented at the Congr. Nacional sobre Essencias Nativas, Campos do Jordao, 12-18 Sep. 1982 Sponsored by NASA ERTS
(E83-10025; NASA-CR-169498; NAS 1.26:169498; INPE-2526-PRE/195) Avail: NTIS HC A02/MF A01

Channel 5 and 7 LANDSAT imagery at the scale of 1:250,000 made during passes in the dry and rainy seasons were used to select the optimal season for cerrado characterization in Mato Grosso do Sul State. The study area is located around the cities of Campo Grande and Tres Lagoas, a region being used for reforestation and rangeland activities. Imagery acquired during the dry season permitted a good discrimination between 'cerrado' (woodsy pasture) vegetation and reforestation. In relation to the altered areas, only the recently modified area presented good discrimination of cerrado vegetation. Imagery of the rainy season did not provide a reasonable separation between cerrado and reforestation areas but the altered area could be easily discriminated. A.R.H.

N83-13520*# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
HCMM HYDROLOGICAL ANALYSIS IN UTAH Final Report
A. Woodruff Miller, Principal Investigator May 1982 178 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM (Contract NAS5-26473)
(E83-10026; NASA-CR-169499; NAS 1.26:169499) Avail: NTIS HC A09/MF A01 CSCL 08H

The feasibility of applying a linear model to HCMM data in hopes of obtaining an accurate linear correlation was investigated. The relationship among HCMM sensed data surface temperature and red reflectivity on Utah Lake and water quality factors including algae concentrations, algae type, and nutrient and turbidity concentrations was established and evaluated. Correlation (composite) images of day infrared and reflectance imagery were assessed to determine if remote sensing offers the capability of using masses of accurate and comprehensive data in calculating evaporation. The effects of algae on temperature and evaporation were studied and the possibility of using satellite thermal data to locate areas within Utah Lake where significant thermal sources

exist and areas of near surface groundwater was examined.
A.R.H.

N83-13521*# Survey of India, Dehra Dun. Geodetic and Research Branch.
ANALYSIS OF MAGSAT DATA OF THE INDIAN REGION Progress Report, 2 Feb. - 31 May 1982
G. C. Agarwal and M. G. Arur 30 Jun. 1982 4 p Sponsored by NASA ERTS
(E83-10027; NASA-CR-169500; NAS 1.26:169500; Rept-4) Avail: NTIS HC A02/MF A01 CSCL 02C

Data tapes were decoded and 24 tracks over the Indian region were reduced to common elevation. Profiles of raw scalar and vector field data and the residuals along few passes were prepared. An anomaly data set was created from the Investigator-B tape. Data was sampled on an 0.5 deg by 0.5 deg grid. A.R.H.

N83-13522*# Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
USE OF THERMAL INERTIA DETERMINED BY HCMM TO PREDICT NOCTURNAL COLD PRONE AREAS IN FLORIDA Progress Report, 16 Dec. 1981 - 15 Jun. 1982
L. H. Allen, Jr., Principal Investigator, Ellen Chen, J. D. Martsolf, and P. H. Jones 15 Jun. 1982 10 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-26453)
(E83-10028; NASA-CR-169501; NAS 1.26:169501) Avail: NTIS HC A02/MF A01 CSCL 08B

A different model is being adapted to handle Florida HCMM data and conditions in an effort to overcome difficulties encountered in extracting data from computer compatible tapes. A.R.H.

N83-13523*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
GEOLOGICAL-STRUCTURAL INTERPRETATION USING PRODUCTS OF REMOTE SENSING IN THE REGION OF CARRANCAS, MINAS GERAIS, BRAZIL [INTERPRETACAO GEOLOGICA-ESTRUTURAL UTILIZANDO PRODUTOS DE SENSORIAMENTO REMOTO NA REGIAO DE CARRANCAS. MINAS GERAIS, BRASIL]
Nelson de Jesus Parada, Principal Investigator, Athos Ribeiro dosSantos, Celio Eustaquio dosAnjos, Marx Prestes Barbosa, and Paulo Veneziani Sep. 1982 24 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E83-10029; NASA-CR-169502; NAS 1.26:169502; INPE-2528-RPE/416) Avail: NTIS HC A02/MF A01 CSCL 08G

The efficiency of some criteria developed for the utilization of small scale and low resolution remote sensing products to map geological and structural features was demonstrated. Those criteria were adapted from the Logical Method of Photointerpretation which consists of textural qualitative analysis of landforms and drainage net patterns. LANDSAT images of channel 5 and 7, 4 LANDSAT-RBV scenes, and 1 radar mosiac were utilized. The region of study is characterized by supracrustal metassediments (quartzites and micaschist) folded according to a 'zig-zag' pattern and gnaissic basement. Lithological-structural definition was considered outstanding when compared to data acquired during field work, bibliographic data and geologic maps acquired in larger scales.
Author

N83-13524*# Indian Inst. of Geomagnetism, Bombay.
MAGSAT PROJECT Quarterly Report
8 May 1981 1 p Sponsored by NASA ERTS
(E83-10030; NASA-CR-169503) Avail: NTIS HC A02/MF A01 CSCL 05B

Programs for the conversion of MAGSAT tapes (both CHRONICLE and CHRONINT formats) from IBM binary to DEC 10 binary were developed in ASSEMBLY language) and programs for selection of only a particular part of CHRONICLE tape (e.g., passes over the Indian subcontinent) were also prepared. Data on a few selected quiet and disturbed days were studied by substracting the main field, and the anomalies over the Indian region were partly identified on few of the passes. A national Workshop on MAGSAT was arranged. The potentialities and usefulness of MAGSAT data particularly in the study of crustal lithology was discussed. Author

N83-13525*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
[GRAVITY AND MAGNETIC ANOMALY DATA ANALYSIS] Quarterly Progress Report, Apr. - Jun. 1982
L. W. Braile, W. J. Hinze, and R. R. B. vonFrese, Principal Investigators 30 Jun. 1982 1 p Sponsored by NASA ERTS
(E83-10031; NASA-CR-169504) Avail: NTIS HC A02/MF A01 CSCL 05B

Progress on the analysis MAGSAT data is reported. The MAGSAT data from 40 deg S to 70 deg N latitude and 30 deg W to 60 E longitude was reduced to radial polarization. In addition, gravity anomaly data from this area were processed and a variety of filtered maps were prepared for combined interpretation of the gravity and magnetic data in conjunction with structural and tectonic maps of the area. The VERSATEC listings and cross-reference maps of variable and array names for the spherical Earth analysis programs NVERTSM, SMFLD, NVERTG, and GFLD were also prepared. M.G.

N83-13526*# Indian Inst. of Geomagnetism, Bombay.
MAGSAT FOR GEOMAGNETIC STUDIES OVER INDIAN REGION Progress Report, 1 Apr. - 31 Jul. 1982
R. G. Rastogi, Principal Investigator 1 Aug. 1982 13 p Sponsored by NASA ERTS
(E83-10032; NASA-CR-169505; NAS 1.26:169505; PR-3) Avail: NTIS HC A02/MF A01 CSCL 09B

Software was prepared for removal of the external field due to the ring current and the associated induced part. Fast Fourier transformation was used to analyse the field of lithosphere with and without external current (+ induced internal current) component. A vertical component in the equatorial electrojet current system was identified from MAGSAT records. A.R.H.

N83-13527*# North Carolina State Univ., Raleigh. Dept. of Marine, Earth and Atmospheric Sciences.
[MAGSAT AND AEROMAGNETIC DATA OF THE CONTINENTAL US] Progress Report
I. J. Won, Principal Investigator 18 Jun. 1982 1 p ERTS
(Contract NAS5-26157)
(E83-10033; NASA-CR-169506) Avail: NTIS HC A02/MF A01 CSCL 05B

The MAGSAT data were used to produce a scalar anomaly map of the U.S. In order to remove the east-west striping anomalies, which are believed to be caused by the low-order polynomials used to reduce the orbital bias errors, a 2-D spectral filtering using the Fourier transform method was applied. The resultant low-pass filtered map, with the east-west stripings removed, resembles much closer the surface aeromagnetic map based on the U.S. MAGNET data. The spectral filtering was also applied to the MAGSAT vector data. Department of Defense gravity data was processed to produce a filtered U.S. gravity map whose spectral contents are comparable to those of the MAGSAT magnetic map. M.G.

N83-13528*# Massachusetts Univ., Amherst. Dept. of Geology.
THE MINERALOGY OF GLOBAL MAGNETIC ANOMALIES Progress Report, Feb. - Aug. 1982
Stephen E. Haggerty, Principal Investigator 13 Aug. 1982 47 p refs ERTS
(Contract NAS5-26414)
(E83-10034; NASA-CR-169507; NAS 1.26:169507) Avail: NTIS HC A03/MF A01 CSCL 08G

The Curie Balance was brought to operational stage and is producing data of a preliminary nature. Substantial problems experienced in the assembly and initial operation of the instrument

were, for the most part, rectified, but certain problems still exist. Relationships between the geology and the gravity and MAGSAT anomalies of West Africa are reexamined in the context of a partial reconstruction of Gondwanaland. A.R.H.

N83-13529*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DEVELOPMENT OF THEMATIC MAPPER VEGETATIVE INDICES FOR ASSESSING BIOMASS IN CORN, SOYBEANS AND WHEAT
B. R. Gardner, D. R. Thompson, K. E. Henderson, and B. L. Blad, Principal Investigators Aug. 1982 88 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10035; NASA-TM-85170; SR-J2-04337; JSC-18264; NAS 1.15:85170) Avail: NTIS HC A05/MF A01 CSCL 02C

Spectral transformations that utilize thematic mapper (TM) bands were found to be highly related to various agronomic parameters such as leaf area index, percent ground cover, total fresh biomass, and plant moisture for corn, soybeans, and wheat. It was found that different spectral transformations are necessary in order to obtain the maximum predictability for each agronomic variable. The TM bands in the water absorption region (1.55 micrometers to 1.75 micrometer and 2.08 micrometer 2.35 micrometer) appear to provide information concerning the water condition of the canopy. Author

N83-13530*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
[GEOLOGIC INTERPRETATION OF HCMM AND AIRCRAFT THERMAL DATA]
25 Feb. 1982 5 p Sponsored by NASA HCMM
(E83-10036; NASA-CR-169508) Avail: NTIS HC A02/MF A01 CSCL 05B

Progress on the Heat Capacity Mapping Mission (HCMM) follow-on study is reported. Numerous image products for geologic interpretation of both HCMM and aircraft thermal data were produced. These include, among others, various combinations of the thermal data with LANDSAT and SEASAT data. The combined data sets were displayed using simple color composites, principal component color composites and black and white images, and hue, saturation intensity color composites. Algorithms for incorporating both atmospheric and elevation data simultaneously into the digital processing for creation of quantitatively correct thermal inertia images, are in the final development stage. A field trip to Death Valley was undertaken to field check the aircraft and HCMM data. M.G.

N83-13531*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
EVALUATION OF ERIM OPTICALLY PROCESSED SEASAT SAR DATA Informal Information Report, Aug. 1981 - Apr. 1982
Robert Shuchman, David R. Lyzenga, Principal Investigators, Alex Klooster, Jr., and James Marks Apr. 1982 45 p refs Original contains imagery. Original imagery may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contracts NAS7-100; JPL-956105)
(E83-10037; NASA-CR-169509; NAS 1.26:169509; ERIM-157800-1-F) Avail: NTIS HC A03/MF A01 CSCL 05B

The results of three studies on the radiometric and geometric properties of optically processed SEASAT SAR imagery are summarized. The accuracy with which the image scale can be predicted based upon a knowledge of the SAR platform and recording system parameters and the processor characteristics was evaluated. The considerations involved in making radiometric measurements from image films, the use of point targets for calibrating the effects of Doppler spectrum shifts on the radiometric calibration of the SAR image data over extended swath lengths was evaluated A.R.H.

N83-13532*# Texas Univ., El Paso. Dept. of Geological Sciences.
[CRUSTAL AND UPPER MANTLE STRUCTURE DATA ANALYSIS] Quarterly Report, 1 Apr. - 30 Jun. 1982
G. R. Keller and E. G. Lidiak, Principal Investigators 30 Jun. 1982 1 p ERTS
(Contract NAS5-26326)
(E83-10038; NASA-CR-169510) Avail: NTIS HC A02/MF A01 CSCL 08G

Approximately 50 seismograms obtained from the National Geophysical and Solar-Terrestrial Data Center were digitized and analysis of surface wave dispersion was begun. M.G.

N83-13533*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LANDSAT-4 IMAGE DATA QUALITY ANALYSIS Progress Report, 9 Aug. - 9 Nov. 1982
P. E. Anuta, Principal Investigator Nov. 1982 22 p ERTS
(Contract NAS5-26859)
(E83-10039; NASA-CR-169511; NAS 1.26:169511; LARS-CR-110982; PR-1) Avail: NTIS HC A02/MF A01 CSCL 05B

Work done on evaluating the geometric and radiometric quality of early LANDSAT-4 sensor data is described. Band to band and channel to channel registration evaluations were carried out using a line correlator. Visual blink comparisons were run on an image display to observe band to band registration over 512 x 512 pixel blocks. The results indicate a .5 pixel line misregistration between the 1.55 to 1.75, 2.08 to 2.35 micrometer bands and the first four bands. Also a four 30M line and column misregistration of the thermal IR band was observed. Radiometric evaluation included mean and variance analysis of individual detectors and principal components analysis. Results indicate that detector bias for all bands is very close or within tolerance. Bright spots were observed in the thermal IR band on an 18 line by 128 pixel grid. No explanation for this was pursued. The general overall quality of the TM was judged to be very high. Author

N83-13534*# Research Triangle Inst., Research Triangle Park, N.C. Office of Geosciences Programs.
A COMPARISON OF HCMM SURFACE TEMPERATURES WITH IN SITU TEMPERATURE DATA Quarterly Progress Report
Fred M. Vukovich, Principal Investigator Jun. 1982 5 p HCMM
(Contract NAS5-26863)
(E83-10040; NASA-CR-169512; NAS 1.26:169512) Avail: NTIS HC A02/MF A01 CSCL 05B

All HCMM required were processed. Calibrated and atmospherically corrected sea surface temperatures were developed for the Nantucket Shoals and Gulf of Mexico regions. These data were analyzed and the sea surface temperatures along the various transacts were compared with in situ data. The comparisons indicate that there is, on the average, a root mean square difference between the in situ data and the HCMM sea surface temperatures of + or - 1.0 C. The linear correlation coefficient was 0.97. A.R.H.

N83-13535*# National Oceanic and Atmospheric Administration, Columbia, Mo.
EVALUATION OF THE WILLIAMS-TYPE SPRING WHEAT MODEL IN NORTH DAKOTA AND MINNESOTA
Sharon LeDuc, Principal Investigator Jan. 1982 45 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10041; NASA-CR-169549; YM-U2-04286; JSC-18233; NAS 1.26:169549; YM-1-4-4(80-01.1)) Avail: NTIS HC A03/MF A01 CSCL 02C

The Williams type model, developed similarly to previous models of C.V.D. Williams, uses monthly temperature and precipitation data as well as soil and topological variables to predict the yield of the spring wheat crop. The models are statistically developed using the regression technique. Eight model characteristics are examined in the evaluation of the model. Evaluation is at the crop reporting district level, the state level and for the entire region. A ten year bootstrap test was the basis of the statistical evaluation. The accuracy and current indication of modeled yield

reliability could show improvement. There is great variability in the bias measured over the districts, but there is a slight overall positive bias. The model estimates for the east central crop reporting district in Minnesota are not accurate. The estimate of yield for 1974 were inaccurate for all of the models. Author

N83-13536*# Agricultural Research Service, Weslaco, Tex.
ESTIMATING TOTAL STANDING HERBACEOUS BIOMASS PRODUCTION WITH LANDSAT MSS DIGITAL DATA Progress Report
A. J. Richardson, J. H. Everitt, and C. L. Wiegand, Principal Investigators Jun. 1982 26 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10045; NASA-CR-169606; EW-U2-04320; JSC-18255; NAS 1.26:169606) Avail: NTIS HC A03/MF A01 CSCL 02C

Rangeland biomass data were correlated with spectral vegetation indices, derived from LANDSAT MSS data. LANDSAT data from five range and three other land use sites in Willacy and Cameron Counties were collected on October 17 and December 10, 1975, and on July 31 and September 23, 1976. The overall linear correlation of total standing herbaceous biomass with the LANDSAT derived perpendicular vegetation index was highly significant ($r = 0.90^{**}$) for these four dates. The standard error of estimate was 722 kg/ha. Biomass data were recorded for two of these range sites for 8 months (March through October) during the 1976 growing season. Standing green biomass accounted for most of the increase in herbage, starting in June and ending about September and October. These results indicate that satellite data may be useful for the estimation of total standing herbaceous biomass production that could aid range managers in assessing range condition and animal carrying capacities of large and inaccessible range holdings. Author

N83-13537*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
BASIC RESEARCH FOR THE GEODYNAMICS PROGRAM Semiannual Status Report, 1 Apr. - 30 Sep. 1982
Ivan I. Mueller Oct. 1982 97 p refs Presented at the 18th Gen. Assembly of the Intern. Astron. Union, Patras, Greece, 17-26 Aug. 1982 Submitted for publication
(Contract NAS5-25888; Grant NsG-5265; OSURF Proj. 711055; OSURF Proj. 712407)
(NASA-CR-169470; NAS 1.26:169470; SASR-9; SASR-6) Avail: NTIS HC A05/MF A01 CSCL 05B

Work performed and data obtained in geodynamic research is reported. The purpose was to obtain utilization of: (1) laser and very long baseline interferometry (VLBI); (2) range difference observation in geodynamics; (3) development of models for ice sheet and crustal deformations. The effects of adopting new precession, nutation and equinox corrections on the terrestrial reference frame are investigated. For individual titles, see N83-13538 through N83-13540.

N83-13538*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
EFFECTS OF ADOPTING NEW PRECESSION, NUTATION AND EQUINOX CORRECTIONS ON THE TERRESTRIAL REFERENCE FRAME
Sheng-Yuan Zhu and Ivan I. Mueller *In its* Basic Res. for the Geodyn. Program Oct. 1982 p 2-18 refs (For primary document see N83-13537 04-43)
Avail: NTIS HC A05/MF A01 CSCL 05B

The effects of adopting new definitive precession and equinox corrections on the terrestrial reference frame was investigated. It is noted that: (1) the effect on polar motion is a diurnal periodic term with an amplitude increasing linearly in time whole on UT1 it is a linear term; (2) general principles are given to determine the effects of small rotations of the frame of a conventional inertial reference system (CIS) on the frame of the conventional terrestrial reference system (CTS); (3) seven CTS options are presented, one of which is necessary to accommodate such rotation. Accommodating possible future changes in the astronomical nutation is discussed. The effects of differences which may exist between the various CTS's and CIS's on Earth rotation parameters (ERP) and how these differences can be determined are examined. It is shown that the CTS differences can be determined from observations made at the same site, while the CIS differences by comparing the ERP's determined by the different techniques during the same time period. E.A.K.

N83-13539*# Ohio State Univ., Columbus.
UTILIZATION OF RANGE-DIFFERENCE OBSERVATIONS IN GEODYNAMICS
In its Basic Res. for the Geodyn. Program Oct. 1982 p 19-45 (For primary document see N83-13537 04-43)
(Contract NAS5-25888)
Avail: NTIS HC A05/MF A01 CSCL 05B

The utilization of simultaneous laser range differences (SRD) for the determination of Earth orientation and baseline variations is summarized. Results from the Aug. 1980 Lageos data collected during the short MERIT campaign, and simulations for a possible station arrangement for the main campaign are reported. E.A.K.

N83-13540*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
GEOMETRIC ADJUSTMENT OF SIMULTANEOUS DOPPLER-DERIVED RANGE DIFFERENCES
Chengze Zhang and Ivan I. Mueller *In its* Basic Res. for the Geodyn. Program Oct. 1982 p 46-94 refs (For primary document see N83-13537 04-43)
Avail: NTIS HC A05/MF A01 CSCL 05B

A mathematical model for the use of simultaneous Doppler derived correlated ranges in the geometric mode is presented. The model was tested with data taken during the EDOC-2 campaign with different integration intervals. The results of this adjustment are compared with the EDOC-2 adopted solution and those from an uncorrelated model used earlier to provide more economical calculations. It is shown that the correlated mode is superior to the uncorrelated one when the optimum integration interval of 23 seconds is used. E.A.K.

N83-13541# Office of Technology Assessment, Washington, D.C.
IMPACTS OF TECHNOLOGY ON US CROPLAND AND RANGELAND PRODUCTIVTY: SUMMARY
Aug. 1982 25 p refs
(OTA-F-167) Avail: NTIS HC A02/MF A01

The effect of agricultural technologies on the inherent productivity of U.S. croplands and rangelands was assessed. Erosion, drainage, soil compaction, salination, ground water depletion and land subsidence are considered. S.L.

N83-13542# Office of Technology Assessment, Washington, D.C.
USE OF MODELS FOR WATER RESOURCES MANAGEMENT, PLANNING AND POLICY: SUMMARY
Aug. 1982 27 p refs
(OTA-O-160) Avail: NTIS HC A03/MF A01

The technical capabilities of mathematical models vary greatly among the water resource issues analyzed; however, the assessment finds that models capable of analyzing many pressing water resource issues are currently available, and have significant potential for increasing the accuracy and effectiveness of information to managers, decision makers, and scientists. Institutional constraints to model use, including lack of information about available models, lack of training in model use and interpretation, lack of communication between decision makers and modelers, and lack of general support services, are identified as major impediments to increased model use for water resource analysis. L.F.M.

N83-13543# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
METHODOLOGICAL PROPOSAL FOR MODELING CROP GROWTH IN ORDER TO ESTIMATE AGRICULTURAL PRODUCTIVITY

Carlos Alberto Cappelletti, Jose Roberto Reis, Luiz Antonio Nogueira Lorena, Nivea Teixeira Dias, Lourdes Bernardete F. daCruz Paiao, Acioli Antonio deOlivo, and Samuel Roberto Ximenes Costa Nov. 1981 14 p refs In PORTUGUESE Presented at the 2nd Natl. School of Operational Res. (II ENPO), 3-5 Nov. 1981, Campina Grande, Brazil Submitted for publication
(INPE-2255-PRE/037) Avail: NTIS HC A02/MF A01

A method for developing a dynamic model for simulation of crop growth in order to estimate productivity is presented. Climatological, physiological, physical, technological, and socio-economic factors are taken into account. The stages of development of the model include the definition of the variables corresponding to the above factors, the identification of the relationship between them, the stratification of the area planted with the crop of interest, and the arrangement and validation of the model. A survey of alternative modeling methods is presented. J.D.

N83-13544*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AIRCRAFT AND SATELLITE MEASUREMENT OF OCEAN WAVE DIRECTIONAL SPECTRA USING SCANNING-BEAM MICROWAVE RADARS
Frederick C. Jackson, W. Travis Walton, and Paul L. Baker (Computer Sciences Corp., Silver Spring, Md.) May 1982 81 p refs Presented at the Wave Dyn. and Radio Probing of the Ocean Surface Symp., Miami, Fla., 14-20 May 1981; sponsored by NAS-NRC Submitted for publication
(NASA-TM-84008; NAS 1.15:84008) Avail: NTIS HC A05/MF A01 CSCL 17I

A microwave radar technique for remotely measuring the vector wave number spectrum of the ocean surface is described. The technique, which employs short-pulse, noncoherent radars in a conical scan mode near vertical incidence, is shown to be suitable for both aircraft and satellite application, the technique was validated at 10 km aircraft altitude, where we have found excellent agreement between buoy and radar-inferred absolute wave height spectra. Author

N83-13545*# General Motors Inst., Flint, Mich. Engineering and Management Inst.
WORKING GROUP ORGANIZATIONAL MEETING Final Report
15 Nov. 1982 217 p Presented at a Meeting to Study to Identify Res. Issues in the Area of Electromagnetic Meas. and Signal Handling of Remotely Sensed Data, Ann Arbor, Mich., 6-7 Aug. 1981
(Contract NAS9-16390)
(NASA-CR-167772; NAS 1.26:167772) Avail: NTIS HC A10/MF A01 CSCL 05B

Scene radiation and atmospheric effects, mathematical pattern recognition and image analysis, information evaluation and utilization, and electromagnetic measurements and signal handling are considered. Research issues in sensors and signals, including radar (SAR) reflectometry, SAR processing speed, registration, including overlay of SAR and optical imagery, entire system radiance calibration, and lack of requirements for both sensors and systems, etc. were discussed. S.L.

N83-13546*# General Motors Inst., Flint, Mich. Engineering and Management Inst.
A STUDY TO IDENTIFY RESEARCH ISSUES IN THE AREA OF ELECTROMAGNETIC MEASUREMENTS AND SIGNAL HANDLING OF REMOTELY SENSED DATA Final Report, Jul. 1981 - Jul. 1982
15 Oct. 1982 50 p refs
(Contract NAS9-16390)
(NASA-CR-167771; NAS 1.26:167771) Avail: NTIS HC A03/MF A01 CSCL 05B

Research issues in the area of electromagnetic measurements and signal handling of remotely sensed data are identified. The following seven issues are discussed; platform/sensor system position and velocity, platform/sensor attitudes and attitude rates, optics and antennas, detectors and associated electronics, sensor calibration, signal handling, and system design. Author

N83-13547*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE USE OF THEMATIC MAPPER SIMULATOR CALIBRATION DATA FOR ASSESSMENT OF DATA QUALITY
Michael L. Forman Dec. 1980 23 p refs
(NASA-TM-82059; NAS 1.15:82059) Avail: NTIS HC A02/MF A01 CSCL 05B

In flight calibration data collected from the thematic mapper simulator (TMS) were used to assess the quality of Earth scan data. The following results are indicated: (1) based on limited samples, individual TMS channels have noise which varies from channel to channel, but remains constant within a channel; (2) short term variations of more than 5% in the average values of calibration source responses indicate problems; and (3) absolute radiometric calibration is unlikely to be meaningful in a temporal sense due to single point calibration methods used. E.A.K.

N83-13548# Purdue Univ., Lafayette, Ind. Dept. of Computer Sciences.
OPTIMAL TILE SALVAGE
Francine Berman, Frank Thomson Leighton (MIT), and Lawrence Snyder May 1982 21 p refs
(Contracts N00014-80-K-0816; N00014-81-K-0360; Grant NSF MCS-80-05387)
(AD-A119117; CSD-TR-401) Avail: NTIS HC A02/MF A01 CSCL 09/1

A map is a tiling of a finite region of the plane with unit squares such that some tiles have been removed. The optimal x x y-Tile Salvage Problem is: Given a map, find the maximum number of non-overlapping x x y tiled rectangles. A polynomial time algorithm is given for the 1 x 2 case, i.e., adjacent pairs. It is shown that the problem is NP-complete for the 2 x 2 case. A polynomial time algorithm is presented for finding 2 x 2 groups that is no worse than one half optimal. The problem is motivated by a technique for increasing the size of very large scale integrated (VLSI) circuit chips. Author (GRA)

N83-13549# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPUTER-ASSISTED MAP COMPARISON M.S. Thesis
Dolf C. Nation 1982 150 p refs
(AD-A119111; AFIT/CI-NR-82-22T) Avail: NTIS HC A07/MF A01 CSCL 08/2

The concept of map comparison is treated in a general manner for thematic, regularly gridded maps. Three methods of map comparison, direct methods, trend surface, and spatial autocorrelation, are investigated. The direct methods and trend surface method are applied to artificial surfaces and subsequently to regularly gridded maps of the pollutant total suspended particulates. A method of forming spatial or two dimensional autocorrelation maps is presented. A strategy based on these methods, is described whereby a large number of regularly gridded maps can be readily compared. Author (GRA)

N83-13550# Army Engineer Topographic Labs., Fort Belvoir, Va.
AN ANALYSIS OF A RELAXATION SCHEME TO IMPROVE TERRAIN ELEVATION DATA
Michael A. Crombie and James A. Shine Jul. 1982 27 p refs
(DA Proj. 4A7-62707-A-855)
(AD-A119257; ETL-0298) Avail: NTIS HC A03/MF A01 CSCL 08/2

Elevation matrices derived from correlation of digital stereo images often contain errors resulting from a breakdown of the correlation process. One such matrix was corrected using a relaxation algorithm where each point was given a reliability based on comparison with its nearest and next-nearest neighbors. These reliabilities were then used to determine if and how much a point was to be corrected; the process was iterated. The algorithm removed small error areas, but large erroneous regions were not corrected, even when terrain slope classification information was considered. Author

N83-13551# ZYCOR, Inc., Austin, Tex.
ALGORITHMS FOR DIGITAL TERRAIN DATA MODELING Final

Report, Sep. 1980 - Feb. 1982
Dale M. Davis, James A. Downing, and Steven Zoraster Ft. Belvoir, Va. Army Engineer Topographic Labs. Jul. 1982 221 p refs
(Contract DAAK70-80-C-0248; AF Proj. 4303)
(AD-A119254; Rept-020-14-05; ETL-0302) Avail: NTIS HC A10/MF A01 CSCL 08/2

Algorithms and test results are described for three different general operations used in computerized modeling and mapping. The algorithms are used for transforming strings of contour data into digital elevation models (DEM), transforming DEM's into a set of contour strings for display, and smoothing DEM's using several filtering and convolution techniques. The use of DEM smoothing operations for the simplification of contour lines is examined and two methods of controlling filter effects for this application are presented. As a separate research effort two interpolation algorithms which can be used for resampling DEM's are compared. Visual and statistical measures of performance are presented.
Author (GRA)

N83-13552# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR UTICA QUADRANGLE, NEW YORK. URANIUM RESOURCE EVALUATION PROJECT
7 Jun. 1982 95 p Prepared in cooperation with Oak Ridge Gaseous Diffusion Plant
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020429; GJBX-85-82; K/UR-440) Avail: NTIS HC A05/MF A01

Hydrogeochemical data which were compiled for stream sediment reconnaissance of Utica quadrangle in New York are presented.
DOE

N83-13553# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR MARION, CANTON, PITTSBURGH AND CLEVELAND QUADRANGLES, OHIO; WEST VIRGINIA; PENNSYLVANIA. URANIUM RESOURCE EVALUATION PROJECT
7 Jun. 1982 61 p Prepared in cooperation with Oak Ridge Gaseous Diffusion Plant
(Contracts DE-AC13-76G-01664; W-7405-eng-26)
(DE82-020430; GJBX-80-82; K/UR-435) Avail: NTIS HC A04/MF A01

Data were compiled for the hydrogeochemical and stream sediment reconnaissance of Marion, Canton, Pittsburgh, and Cleveland quadrangles of Ohio, West Virginia, and Pennsylvania.
DOE

N83-13554# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR BEAUMONT, LAKE CHARLES AND BATON ROUGE QUADRANGLES, TEXAS; LOUISIANA. URANIUM RESOURCE EVALUATION PROJECT
7 Jun. 1982 21 p Prepared in cooperation with Oak Ridge Gaseous Diffusion Plant
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020438; GJBX-66-82; K/UR-421) Avail: NTIS HC A02/MF A01

Hydrogeochemical data were compiled for stream sediment reconnaissance of Beaumont, Lake Charles, and Baton Rouge quadrangles in Texas and Louisiana.
DOE

N83-13555# Los Alamos Scientific Lab., N. Mex.
THREE APPLICATIONS OF HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE-DATA INTERPRETATION FOR A SELECTED REGION IN SOUTH CENTRAL ALASKA. NATIONAL URANIUM RESOURCE EVALUATION
Michael Beyth, Carlotta McInteer (Bendix Field Engineering Corp.), Walter R. Averett (Bendix Field Engineering Corp.), and Newton K. Stablein Feb. 1982 108 p refs
(Contracts DE-AC13-76GJ-01664; W-7405-eng-36)
(DE82-020327; LA-8465-MS; GJBX-138-82) Avail: NTIS HC A06/MF A01

Data analysis to evaluate uranium and other strategically important mineral resources was carried out on hydrogeochemical and stream sediment reconnaissance data from a selected region in south-central Alaska. Parts of the Alaska Range have areas that appear to be favorable for the occurrence of uranium; the main source rocks were probably Tertiary granitic plutons. It is suggested that there is a probable association of uranium with copper, nickel, and base metals. Sediments with significantly high gold, tin, antimony, tungsten, and cadmium are associated with main mineralized areas.
DOE

N83-13556# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR BANGOR QUADRANGLE, MAINE. URANIUM RESOURCE EVALUATION PROJECT
9 Jun. 1982 116 p Prepared in cooperation with Oak Ridge Gaseous Diffusion Plant
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020453; GJBX-88-82; K/UR-443) Avail: NTIS HC A06/MF A01

Hydrogeochemical data are compiled for stream sediment reconnaissance of Bangor quadrangle in Maine.
DOE

N83-13557# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR OGDENSBURG AND LAKE CHAMPLAIN QUADRANGLES, NEW YORK; VERMONT. URANIUM RESOURCE EVALUATION PROJECT
9 Jun. 1982 75 p Prepared in cooperation with Oak Ridge Gaseous Diffusion Plant
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020417; GJBX-87-82; K/UR-442) Avail: NTIS HC A04/MF A01

Hydrogeochemical data which were compiled for stream sediment reconnaissance of Ogdensburg and Lake Champlain quadrangles in New York and Vermont are presented.
DOE

N83-13558# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR JENKINS QUADRANGLE, KENTUCKY; VIRGINIA; WEST VIRGINIA. URANIUM RESOURCE EVALUATION PROJECT
3 Jun. 1982 96 p
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020431; GJBX-78-82; K/UR-433) Avail: NTIS HC A05/MF A01

Hydrogeochemical data which were compiled for the stream sediment reconnaissance of Virginia, West Virginia, and Jenkins Quadrangle in Kentucky are presented.
DOE

N83-13559# Bendix Field Engineering Corp., Grand Junction, Colo.
HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE BASIC DATA FOR SHERMAN, TAXARKANA, EL DORADO, AND GREENWOOD QUADRANGLES, OKLAHOMA; TEXAS; ARKANSAS; MISSISSIPPI
9 Jun. 1982 95 p
(Contracts DE-AC13-76GJ-01664; W-7405-eng-26)
(DE82-020436; GJBX-69-82; K/UR-424) Avail: NTIS HC A05/MF A01

Data which were compiled for the hydrogeochemical and stream-sediment reconnaissance of Sherman, Texarkana, El Dorado, and Greenwood quadrangles in Oklahoma, Texas, Arkansas, and Mississippi are presented.
DOE

N83-13560# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE OF THE SELAWIK NTMS QUADRANGLE, ALASKA
L. C. Hardy, comp., R. F. DAndrea, Jr., comp., R. J. Zinkl, comp., D. L. Shettel, Jr., comp., and S. L. Langfeldt, comp. Jul. 1982 103 p refs Prepared in cooperation with LASL
(Contracts DE-AC13-76GJ-01664; W-7405-eng-36)
(DE82-020448; GJBX-139-82) Avail: NTIS HC A06/MF A01

This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Selawik NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine readable form. These machine readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from data release presents location data, field analyses, and laboratory analyses of several different sample media. The sample medias are described and the analytical results for each medium are summarized. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream sediment, lake sediment, stream water, and lake water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included along with maps showing results of multivariate statistical analyses. DOE

N83-13561# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE OF THE BENDELEBEN NTMS QUADRANGLE
S. L. Langfeldt, comp., L. C. Hardy, comp., R. F. DAndrea, Jr., comp., R. J. Zinkl, comp., and D. L. Shettel, Jr., comp. Jul. 1982 113 p refs Prepared in cooperation with LASL
(Contracts DE-AC13-76GJ-01664; W-7405-eng-36)
(DE82-020446; GJBX-143-82) Avail: NTIS HC A06/MF A01

Results of a hydrogeochemical and stream sediment reconnaissance (HSSR) of the Bendeleben quadrangle, Alaska are given. Location data, field analyses, and laboratory analysis of several different sample media are given. The sample media and summarize the analytical results for each medium are described. The data were subdivided by one of the Los Alamos National Laboratory sorting program stream water, and lake water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements were included. Also included are maps showing results of multivariate statistical analyses. DOE

N83-13562# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE OF THE SEWARD NTMS QUADRANGLE, ALASKA
R. F. DAndrea, Jr., comp., R. J. Zinkl, comp., D. L. Shettel, Jr., comp., D. L. Langfeldt, comp., and L. D. Hardy, comp. Jul. 1982 131 p Prepared in cooperation with LASL
(Contracts DE-AC13-76GJ-01664; W-7405-eng-36)
(DE82-020447; GJBX-140-82) Avail: NTIS HC A07/MF A01

Results of a Hydrogeochemical and Stream-Sediment Reconnaissance (HSSR) of the Seward NTMS quadrangle, Alaska are given. Presented are location data, field analyses, and laboratory analyses of several different sample media. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data were been subdivide by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements were included. Also included are maps showing results of multivariate statistical analyses. DOE

N83-13563# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE OF THE GLASGOL NTMS QUADRANGLE, MONTANA
D. L. Shettel, Jr., comp., S. L. Langfeldt, comp., L. C. Hardy, comp., R. F. DAndrea, Jr., comp., and R. J. Zinkl, comp. Jun. 1982 153 p refs Prepared in cooperation with LASL
(Contracts DE-AC13-76GJ-01664; W-7405-eng-36)
(DE82-020450; GJBX-40-82) Avail: NTIS HC A08/MF A01

Location data and results of field and laboratory analyses of several different sample media are presented. Sample media are described and the analytical results for each medium are summarized. The data are subdivided into groups of stream sediment, stream water, and ground water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included as well as maps showing results of multivariate statistical analyses. DOE

N83-13564# Bendix Field Engineering Corp., Grand Junction, Colo.
URANIUM HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE OF THE CHARLEY RIVER NTMS QUADRANGLE, ALASKA
R. J. Zinkl, comp., L. D. Hardy, comp., and R. F. DAndrea, Jr., comp. Aug. 1982 147 p Prepared in cooperation with LASL
(Contract DE-AC13-76GJ-01664)
(DE82-021668; GJBX-178-82) Avail: NTIS HC A07/MF A01

This abbreviated data release presents location data, field analyses, and laboratory analysis of several different sample media. The sample media are described and the analytical results for each medium are summarized. The data are subdivided into groups of stream sediment and lake sediment ground water samples. For each group which contains a sufficient number of maps of pertinent elements are included as well as maps showing results of multivariate statistical analyses. DOE

N83-13565# Minnesota Dept. of Natural Resources, St. Paul.
INVENTORY OF PEAT RESOURCES, AITKIN COUNTY, MINNESOTA. APPENDIX D: OBSERVATION SITE DESCRIPTIONS
1982 57 p
(Contract DE-FG01-79ET-14692)
(DE82-020732; DOE/ET-14692/T3-App-D) Avail: NTIS HC A04/MF A01

Supplementary data on the peat resources of Aitkin County, Minnesota, are provided. Included are site locations; peat profile descriptions, including underlying soil texture; vegetation descriptions; microrelief; and depth to water table. DOE

N83-13566# Los Alamos Scientific Lab., N. Mex.
INVESTIGATION OF A SHALLOW AQUIFER NEAR THE FENTON HILL HOT DRY ROCK SITE USING DC RESISTIVITY
C. F. Pearson Oct. 1981 19 p refs
(Contract W-7405-eng-36)
(DE82-004175; LA-8999-MS) Avail: NTIS HC A02/MF A01

A shallow aquifer in the base of the Tertiary volcanic sequence was investigated using a series of 9 DC Schlumberger soundings taken within 10 km of the Fenton Hill hot dry rock geothermal site. The aquifer dips to the southwest following the top of the Abo formation, which acts as an aquiclude. Depth increases from 130 m in the eastern part of the study area to 260 m at 1.5 km west of the Fenton Hill site. Aquifer resistivities varied from 13 omega m to 126 omega m, which could be caused by variable permeability in the aquifer. Using results from empirical studies permeabilities ranging from 40 darcies to less than 0.3 darcies were estimated with the highest values occurring nearest to the Fenton Hill site. DOE

N83-13567# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
A DIGITAL PHOTOGRAMMETRIC SYSTEM (DPS) FOR PRODUCING DIGITAL ELEVATION MODELS (DEM) AND ORTHOPLATES BY MEANS OF LINEAR ARRAY SCANNER IMAGERY
Otto Hofmann, Peter Nave, and Heinrich Ebner (Tech. Univ., Munich) 1981 13 p refs
(MBB-UA-618/81) Avail: Issuing Activity

A digital procedure for the generation and processing of scanner images is presented. The terrain is scanned by an opto-electronic three-line scan camera from aircraft, missiles or spacecraft. Three linear sensor arrays are arranged in the focal plane of the camera objective perpendicularly to the flight course. Each sensor array produces an image strip of the covered terrain according to the pushbroom principle. Nodes of the DEM to be

computed are selected in the middle image strip whose object planes are nearly vertical. The conjugate image points in the other two image strips are determined by area correlation methods. The coordinates of all these image points and a few control points are inserted into a least squares adjustment for computation of the orientation parameters of the camera along its entire flight course and the coordinates of the DEM. Raster plots of ortho and stereo orthophotos are produced after digital rectification of the image strips, utilizing the nodes of the DEM grid. Author (ESA)

N83-13568# Geological Survey, Tucson, Ariz.
WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1980
Feb. 1982 580 p
(PB82-237983; USGS/WDR/AZ-80/1; USGS/WRD/HD-81/015) Avail: NTIS HC A25/MF A01 CSCL 08H

Water resources data for the 1980 water year for Arizona consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water levels of observation wells; and quality of ground water. Discharge records for 240 gaging stations, annual peaks for 61 crest stage partial record stations, and discharge measurements at 14 miscellaneous sites; contents only records for 9 lakes and reservoirs; stage and contents for one lake; elevation and discharge for one streamflow station; elevation only for one streamflow station; gage height only for one head over a dam and other measurements are reported. GRA

N83-13569# Geological Survey, Nashville, Tenn. Water Resources Div.
WATER RESOURCES DATA FOR TENNESSEE Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Oct. 1981 531 p Prepared in cooperation with the Tennessee Dept. of Conservation, Nashville
(PB82-240383; USGS/WRD/HD-81/014; USGS/WDR/TN-80/1) Avail: NTIS HC A23/MF A01 CSCL 08H

Water resources data for the 1980 water year for Tennessee consist of records of stage, discharge, and water quality of streams and springs; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. Discharge records for 108 gaging station; stage only records for one lake gaging station; elevation and contents for 27 lakes and reservoirs; water quality for 82 stations and 21 wells; and water levels for 26 observation wells are reported. GRA

N83-13570# Massachusetts Inst. of Tech., Cambridge. Sea Grant College Program.
TOWARD DEEP OCEAN MINING IN THE NINETIES: A DESCRIPTION OF THE PREPRODUCTION AND COMMERCIAL STAGES OF A HYPOTHETICAL PIONEER VENTURE
J. D. Nyhart, Michael S. Triantafyllou, James M. Averback, and Michael A. Gillia Apr. 1982 38 p refs
(Grant NA79AA-D-00101)
(PB82-221151; MITSG-82-1; NOAA-82051015) Avail: NTIS HC A03/MF A01 CSCL 08I

A narrative describing the projected major events for a hypothetical pioneer deep ocean mining project involved in the mining of manganese nodules is given. The events of concern are mainly those leading to full commercial production for the project. The operating entity is assumed to be a consortium of companies, working together initially in a contractual arrangement with the pre-production operations carried on by one partner or by an organization formed for that purpose. This consortium is assumed to be based in the U.S., with processing facilities located in the western U.S. The manganese nodules are assumed to be recovered from a Pacific Ocean mine-site located within a belt of ocean bottom south of the Hawaiian Islands and north of the Equator. This area contains manganese nodules with comparatively high concentrations of nickel, copper and cobalt. GRA

N83-13571# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geophysical Sciences Branch.
NEAR-INFRARED REFLECTANCE OF SNOW-COVERED SUBSTRATES
Harold W. OBrien and Gary Koh Nov. 1981 25 p refs
(DA Proj. 4A1-61102-AT-24)
(PB82-229964; CRREL-81-21; NOAA-82051010) Avail: NTIS HC A02/MF A01 CSCL 08L

The reflection of solar radiation by a snow cover in situ and the apparent influence of selected substrates were examined in wavelength bands centered at 0.81, 1.04, 1.10, 1.30, 1.50 and 1.80 micrometers. Substrates included winter wheat; timothy, corn, alfalfa, grass, concrete and subsurface layers of 'crusty' snow and ice. Reasonable qualitative agreement between measurements and theoretical predictions was demonstrated, with indications of quantitative agreement in the definition of a 'semi-infinite depth' of snow cover. It was concluded that ultimate quantitative agreement between theory and measurement will require that an 'optically effective grain size' be defined in terms of physically measurable dimensions or neteorologically predictable characteristics of the ice crystals composing the snowpack. Author (GRA)

N83-13572*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE BERING SEA ICE COVER DURING MARCH 1979: COMPARISON OF SURFACE AND SATELLITE DATA WITH THE NIMBUS-7 SMMR Annual Report
Seelye Martin, Donald J. Cavalieri, Per Gloersen, and S. Lyn McNutt Jan. 1982 55 p refs Prepared in cooperation with Washington Univ.
(Grant NAG5-161; Contracts MO-A01-78-00-4335; NA81RAC000-13)
(NASA-CR-169393; NAS 1.26:169393; PB82-230400; NOAA-82051011) Avail: NTIS HC A04/MF A01 CSCL 08L

During March 1979, field operations were carried out in the Marginal Ice Zone (MIZ) of the Bering Sea. The field measurements which included oceanographic, meteorological and sea ice observations were made nearly coincident with a number of Nimbus-7 and Tiros-N satellite observations. The results of a comparison between surface and aircraft observations, and images from the Tiros-N satellite, with ice concentrations derived from the microwave radiances of the Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) are given. Following a brief discussion of the field operations, including a summary of the meteorological conditions during the experiment, the satellite data is described with emphasis on the Nimbus-7 SMMR and the physical basis of the algorithm used to retrieve ice concentrations. GRA

N83-13573# International Geophysical Year World Data Center A, Boulder, Colo.
GLACIAL HYDROLOGY: BIBLIOGRAPHY ON THE HYDROLOGY OF GLACIERIZED AREAS
Gordon J. Young, ed. Mar. 1982 138 p
(PB82-237801; GD-12; NOAA-82052414; ISSN-0149-1776) Avail: NTIS HC A07/MF A01 CSCL 08L

Information on the runoff from glaciers and glacierized basins, predictions concerning agricultural, power supply and transportation purposes, and control for irrigation and flood protection is given. A Working Group of the International Commission on Snow and Ice prepared a major compilation of literature dealing with this subject. The bibliography is selective. The basic breakdown of the bibliography is geographical, by country or region. GRA

N83-13574# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Natural Disasters.
STORMS, FLOODS AND DEBRIS FLOWS IN SOUTHERN CALIFORNIA AND ARIZONA 1978 AND 1980: OVERVIEW AND SUMMARY OF A SYMPOSIUM
Norman H. Brooks May 1982 56 p Symp. held in Pasadena, Calif., 17-18 Sep. 1980 Sponsored in part by the California Inst. of Technology
(Grant NSF CEE-78-10631)
(PB82-224221; CSS-CND-019A) Avail: NTIS HC A04/MF A01 CSCL 08H

A symposium for discussion of the flooding events in Southern

California and Arizona in the wet winter periods of 1978 and 1979 is summarized. The subject areas covered are: storm meteorology, downstream river flooding, upland floods and sediment transport, landslides, case studies of engineering problems, effects on shoreline, and policies for flood control and hazard mitigation. GRA

N83-13575# Geological Survey, Carson City, Nev. Water resources Div.
WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1980 Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1982 441 p
(PB82-237991; USGS/WDR/NV-80/1; USGS/DRD/HD-81/031) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1980 water year and records of discharge and water quality for streams are presented. The records include water discharge at 134 gaging stations; stage and contents for 21 lakes and reservoirs; water quality data for continuing record stations at 40 stream sites and 1 lake site, for partial record stations at 65 stream sites and 3 lake sites; and water levels for 211 observation wells. GRA

N83-13576# Geological Survey, Towson, Md. Water Resources Div.
WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1981
Apr. 1982 510 p Prepared in cooperation with the State of Maryland and Delaware and other agencies
(PB82-238007; USGS/WDR/MD/DE-81/1; USGS/WRD/HD-82/030) Avail: NTIS HC A22/MF A01 CSCL 08H

Water resources data for Maryland and Delaware consist of records of stage, discharge, and water quality of streams, stage and contents of lakes and reservoirs; and water levels and water quality of ground water wells. Water discharge data at 120 gaging stations; stage and contents at 1 reservoir; water quality at 48 gaging stations and 74 wells; and water levels at 27 observation wells are included. GRA

N83-13577# Geological Survey, Baton Rouge, La. Water Resources Div.
WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1981. VOLUME 2: SOUTHERN LOUISIANA Progress Report, 1 Oct. 1980 - 30 Sep. 1981
Jan. 1982 338 p refs 3 Vol.
(PB82-238379; USGS/WDR/LA-81/2; USGS/WRD/HD-81/013) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1981 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains records for water discharge at 81 gaging stations (including stage for 76 of these stations); stage only for 37 gaging stations and 10 lakes; contents for 1 reservoir; water quality for 142 surface water stations (including 35 gaging stations), 27 miscellaneous sites, and 10 lakes, and 286 wells; and water levels for 679 observation wells. Author (GRA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-13578* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 34
Jul. 1982 316 p
(NASA-SP-7043(34); NAS 1.21:7043(34)) Avail: NTIS HC $15.00 CSCL 10B

This bibliography lists 1015 reports, articles, and other documents introduced into the NASA scientific and technical information system from April 1, 1981 through June 30, 1981. A.R.H.

N83-13579* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR CELL HAVING IMPROVED BACK SURFACE REFLECTOR Patent
An-Ti Chai, inventor (to NASA) Issued 19 Oct. 1982 5 p Filed 11 Mar. 1981
(NASA-Case-LEW-13620-1; US-Patent-4,335,196; US-Patent-Appl-SN-242796; US-Patent-Class-136-259; US-Patent-Class-29-572; US-Patent-Class-136-256; US-Patent-Class-357-30; US-Patent-Class-427-88; US-Patent-Class-427-89; US-Patent-Class-427-90; US-Patent-Class-427-91) Avail: US Patent and Trademark Office CSCL 10A

The operating temperature is reduced and the output of a solar cell is increased by using a solar cell which carries electrodes in a grid finger pattern on its back surface. These electrodes are sintered at the proper temperature to provide good ohmic contact. After sintering, a reflective material is deposited on the back surface by vacuum evaporation. Thus, the application of the back surface reflector is separate from the back contact formation. Back surface reflectors formed in conjunction with separate grid finger configuration back contacts are more effective than those formed by full back metallization of the reflector material. Official Gazette of the U.S. Patent and Trademark Office

N83-13580 Utah State Univ., Logan.
A COMPUTER SIMULATION MODEL OF SALT-GRADIENT SOLAR PONDS Ph.D. Thesis
Zahra Panahi 1982 196 p
Avail: Univ. Microfilms Order No. DA8224162

The mass and energy transfer processes of a salt gradient solar pond were developed into a finite element of computer model. The system represented by the model can be: (1) a nonconvective salt gradient solar pond for which the energy transfer takes place by conduction through the brine and the ground beneath the pond; (2) a stratified three zone solar pond consisting of upper and lower convective zones and a nonconvective gradient zone in between. The temperature of the upper and lower convective zones are predicted in terms of the net energy input to the zones. The energy fluxes at the pond surface include: reflected and absorbed solar radiation, evaporation energy loss, net long wave radiation loss to the atmosphere, advacted energy of precipitation and inflow water, and convective heat loss at the surface. Dissert. Abstr.

N83-13581*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR THERMAL TECHNOLOGY REPORT, FY 1981. VOLUME 1: EXECUTIVE SUMMARY Annual Technical Progress Report
Jun. 1982 11 p refs Sponsored in part by NASA 2 Vol.
(Contracts DE-AI01-79ET-20307; DE-AM04-80AL-13137)
(NASA-CR-169526; JPL-Pub-82-60-Vol-2; DOE/JPL-1060-53-Vol-2; NAS 1.26:169526) Avail: NTIS HC A02/MF A01 CSCL 10A

The activities of the Department of Energy's Solar Thermal Technology Program are discussed. Highlights of technical activities and brief descriptions of each technology are given. Solar thermal conversion concepts are discussed in detail, particularly concentrating collectors and salt-gradient solar ponds. R.J.F.

N83-13582*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR THERMAL TECHNOLOGY REPORT, FY 1981. VOLUME 2: TECHNICAL Annual Technical Progress Report
Jun. 1982 113 p refs Sponsored in part by NASA 2 Vol.
(Contracts DE-AI01-79ET-20307; DE-AM04-80AL-13137)
(NASA-CR-169527; JPL-Pub-82-60-Vol-1;
DOE/JPL-1060-53-Vol-1; NAS 1.26:169527) Avail: NTIS HC A06/MF A01 CSCL 10A

Detailed descriptions of the Department of Energy's Solar Thermal Technology Program projects and activities are given. A bibliography on solar energy conversion is included. R.J.F.

N83-13583*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PRICE ESTIMATES FOR THE PRODUCTION OF WAFERS FROM SILICON INGOTS
A. R. Mokashi 15 Sep. 1982 30 p refs
(Contract DE-AI01-76ET-20356)
(NASA-CR-169517; DOE/JPL-1012-74; JPL-5101-212;
JPL-Pub-82-65; NAS 1.26:169517) Avail: NTIS HC A03/MF A01 CSCL 10A

The status of the inside-diameter sawing, (ID), multiblade sawing (MBS), and fixed-abrasive slicing technique (FAST) processes are discussed with respect to the estimated price each process adds on to the price of the final photovoltaic module. The expected improvements in each process, based on the knowledge of the current level of technology, are projected for the next two to five years and the expected add-on prices in 1983 and 1986 are estimated. M.G.

N83-13584# Office of Technology Assessment, Washington, D.C.
TECHNOLOGY AND SOVIET ENERGY AVAILABILITY: SUMMARY
Nov. 1981 27 p refs
(OTA-ISC-154) Avail: NTIS HC A03/MF A01

The course Soviet energy production will take if present policies in the West and the USSR remain unchanged is investigated. Opportunities and problems in the five primary Soviet energy industries: oil, gas, coal, nuclear, and electric power; equipment and technology requirements; and the implications of providing or withholding assistance are addressed. N.W.

N83-13585*# DHR, Inc., Washington, D.C.
MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS WORLDWIDE Final Report
A. Cabraal, D. Delasanta, J. Rosen, J. Nolfi (ARD, Inc.), and R. Ulmer (ARD, Inc.) Nov. 1981 89 p refs
(Contracts DEN3-180; DE-AI01-79ET-20485)
(NASA-CR-165541; DOE/NASA/0180-6; NAS 1.26:165541) Avail: NTIS HC A05/MF A01 CSCL 10B

Agricultural sector PV market assessments conducted in the Phillippines, Nigeria, Mexico, Morocco, and Colombia are extrapolated worldwide. The types of applications evaluated are those requiring less than 15 kW of power and operate in a stand alone mode. The major conclusions were as follows: PV will be competitive in applications requiring 2 to 3 kW of power prior to 1983; by 1986 PV system competitiveness will extend to applications requiring 4 to 6 kW of power, due to capital constraints, the private sector market may be restricted to applications requiring less than about 2 kW of power; the ultimate purchase of larger systems will be governments, either through direct purchase or loans from development banks. Though fragmented, a significant agriculture sector market for PV exists; however, the market for PV in telecommunications, signalling, rural services, and TV will be larger. Major market related factors influencing the potential for U.S. PV Sales are: lack of awareness; high first costs; shortage of long term capital; competition from German, French and Japanese companies who have government support; and low fuel prices in capital surplus countries. Strategies that may aid in overcoming some of these problems are: setting up of a trade association aimed at overcoming problems due to lack of awareness, innovative financing schemes such as lease arrangements, and designing products to match current user needs as opposed to attempting to change consumer behavior. Author

N83-13586*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUMMARY OF FLAT-PLATE SOLAR ARRAY PROJECT DOCUMENTATION. ABSTRACTS OF PUBLISHED DOCUMENTS, 1975 TO JUNE 1982
15 Sep. 1982 372 p Sponsored in part by DOE
(NASA-CR-169518; JPL-Publ-82-79; DOE/JPL-1012-76;
JPL-5101-221; NAS 1.26:169518) Avail: NTIS HC A16/MF A01 CSCL 10A

Technologies that will enable the private sector to manufacture and widely use photovoltaic systems for the generation of electricity in residential, commercial, industrial, and government applications at a cost per watt that is competitive with other means is investigated. Silicon refinement processes, advanced silicon sheet growth techniques, solar cell development, encapsulation, automated fabrication process technology, advanced module/array design, and module/array test and evaluation techniques are developed. S.L.

N83-13587*# National Aeronautics and Space Administration, Washington, D. C.
SECOND PROGRAM ON ENERGY RESEARCH AND TECHNOLOGIES
Oct. 1982 117 p Transl. into ENGLISH of "Zweites Programm Energieforschung und Energietechnologien" rept. Germany Ministry for Research and Technology, Bonn, 1982 p i-iv, 1-122 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77154; NAS 1.15:77154) Avail: NTIS HC A06/MF A01 CSCL 10B

The second major energy research and development program is described. Renewable and nonrenewable energy resources are presented which include nuclear technology and future energy sources, like fusion. The current status and outlook for future progress are given. E.A.K.

N83-13588*# General Electric Co., Schenectady, N. Y.
EVALUATION OF CATALYTIC COMBUSTION OF ACTUAL COAL-DERIVED GAS Final Report
John C. Blanton and Roger A. Shisler Feb. 1982 54 p refs
(Contracts NAS3-22818; DE-AI01-77ET-10350)
(NASA-CR-167842; DOE/NASA-2818-1; NAS 1.26:167842;
SRD-82-023) Avail: NTIS HC A04/MF A01 CSCL 21B

The combustion characteristics of a Pt-PI catalytic reactor burning coal-derived, low-Btu gas were investigated. A large matrix of test conditions was explored involving variations in fuel/air inlet temperature and velocity, reactor pressure, and combustor exit temperature. Other data recorded included fuel gas composition, reactor temperatures, and exhaust emissions. Operating experience with the reactor was satisfactory. Combustion efficiencies were quite high (over 95 percent) over most of the operating range. Emissions of NOx were quite high (up to 500 ppm V and greater), owing to the high ammonia content of the fuel gas. Author

N83-13589*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHODS OF REDUCING ENERGY CONSUMPTION OF THE OXIDANT SUPPLY SYSTEM FOR MHD/STEAM POWER PLANTS
A. J. Juhasz 1982 15 p Proposed for presentation at the 21st Aerospace Sci. Meeting, Reno, Nev., 10-13 Jan. 1983; sponsored by AIAA
(Contract DE-AI01-77ET-10769)
(NASA-TM-83025; DOE/NASA/10769-28; E-1461; NAS 1.15:83025) Avail: NTIS HC A02/MF A01 CSCL 10B

An in-depth study was conducted to identify possible improvements to the oxidant supply system for combined cycle MHD power plants which would lead to higher thermal efficiency and reduction

in the cost of electricity, COE. Results showed that the oxidant system energy consumption could be minimized when the process was designed to deliver a product O2 concentration of 70 mole percent. The study also led to the development of a new air separation process, referred to as liquid pumping and internal compression. MHD system performance calculations show that the new process would permit an increase in plant thermal efficiency of 0.6 percent while allowing more favorable tradeoffs between magnetic energy and oxidant system capacity requirements. Author

N83-13590# Harry Diamond Labs., Adelphi, Md.
THERMAL BATTERY SYSTEMS FOR ORDNANCE FUZING
Frank C. Krieger Jul. 1982 25 p refs
(DA Proj. 1L1-62603-AH-18; HDL Proj. A18147)
(AD-A119155; HDL-TR-1989) Avail: NTIS HC A02/MF A01 CSCL 10/3

Thermal battery technology for ordnance fuzing is reviewed. Most present thermal batteries use the Ca/LiCl-KCl eutectic/CaCrO4 system. This system is highly reliable when properly fabricated, but is subject to electrical short circuiting from CaLi2 formed during operation and is capacity and rate limited by anodic film formation. Proposed replacement electrochemical systems use lithium or its alloys as anodes to eliminate these difficulties, but the high chemical reactivity of lithium causes storage and handling problems. Anodes of calcium alloys might eliminate short circuiting and increase electrical output above that of the Ca/LiCl-KCl eutectic/CaCrO4 system without causing the handling and storage difficulties of the lithium systems. The calcium alloy anode should be researched to determine its capabilities in practical batteries. Author (GRA)

N83-13591# Honeywell Power Sources Center, Horsham, Pa.
LITHIUM-SULFUR DIOXIDE (LI/SO2) BATTERY SAFETY HAZARDS. THERMAL STUDIES Final Report, 24 Dec. 1980 - 5 Mar. 1982
Walter B. Ebner, Kwang Y. Kim, and H. V. Venkatasetty Mar. 1982 246 p
(Contract N60921-81-C-0085)
(AD-A119381) Avail: NTIS HC A11/MF A01 CSCL 10/3

In this program, the Accelerating Rate Calorimeter (ARC) has been employed to study the thermal and pressure behavior of exothermic reactions occurring in Li/SO2 cells under the conditions of (1) forced overdischarge at ambient temperature, (2) resistive overdischarge at ambient temperature, (3) forced overdischarge at -35 C, and (4) discharge at -35 C. Detected reactions have been characterized in terms of self-heating rate, rate of pressure generation, magnitude of overall heat generation, magnitude of overall pressure rise, and kinetic parameters including activation energy and reaction order. Micro-calorimeter studies determined the heat of reaction for the lithium/acetonitrile reaction to be -54 + or - 1.0 kcal/mole-Li. Lithium/aluminum alloy was found to be unreactive with acetonitrile at ambient temperature. Preliminary investigations were also carried out using FTIR spectroscopy to study the products of electrolyte oxidation on nickel and stainless steel electrodes. Author (GRA)

N83-13592# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aerospace Power Div.
TESTING OF AN IMPROVED LITHIUM-SULFUR DIOXIDE BATTERY FOR AIRCREW LIFE SUPPORT EQUIPMENT Final Report, Jan. 1979 - Oct. 1981
James S. Cloyd May 1982 103 p refs
(AF Proj. 412A)
(AD-A119374; AFWAL-TR-81-2137) Avail: NTIS HC A06/MF A01 CSCL 10/3

This report presents the results of in-house testing of lithium-sulfur dioxide cells. The report includes performance testing of an engineering prototype design of lithium-sulfur dioxide cells and the performance characterization, storage evaluations and abuse test behavior of the pilot production cell design. Several design modifications occurred during the development of this lithium-sulfur dioxide cell technology which significantly changed their performance. Testing of the pilot production cells included: (1) Performance evaluations at rates of 50MA, 100MA, 200MA, and 400 MA at temperatures from -65 F to +140 F; (2) Room temperature discharge tests at high rates of current; (3) Capacity retention capability as a function of storage time at temperatures of 32 F, 70 F and 160 F; (4) Evaluation of intermittent storage capability at 205 F; and (5) Abuse testing. Abuse testing included short circuit, nail penetration, and forced overdischarge conditions. GRA

N83-13593# Teledyne Energy Systems, Timonium, Md.
ADVANCED ALKALINE ELECTROLYSIS CELL DEVELOPMENT. DEVELOPMENT OF ELECTROLYSIS OPERATION CELL SEPARATOR FOR 1250C Summary Report
J. N. Murray Apr. 1982 126 p refs Prepared for Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE82-020697; BNL-51573) Avail: NTIS HC A07/MF A01

The development of an electrode separator that will allow continuous water electrolysis at 1250C is described. This separator has nearly identical mechanical characteristics relative to the existing commercial asbestos separator which appears to be limited chemically to operation below 900C. Additional insight into the requirements for an improved anode structure and progress in anode improvements is also discussed. The reporting requirements for participation as part of the International Energy Agency hydrogen production research and development program are included. DOE

N83-13594# National Bureau of Standards, Washington, D.C.
TI-59 PROGRAM FOR CALCULATING THE ANNUAL ENERGY REQUIREMENTS FOR RESIDENTIAL HEATING AND COOLING. VOLUME 1: USERS MANUAL
F. A. Costello, T. Kusuda, and S. Aso Jul. 1982 132 p 2 Vol.
(Contract DE-AD01-76PR-06010)
(DE82-010174; DOE/NBB-0011-Vol-1) Avail: NTIS HC A07/MF A01

The program documentation and user's manual for the TI-59 pocket calculator program for determining annual heating and cooling energy consumption of residential buildings are given. The program embodies the Variable-Base-Degree-Day Method, which was proven to yield equivalent results as obtained by the comprehensive hour-by-hour simulation calculation, such as DOE-2. Given are step-by-step calculation procedure information on input data, sample calculations, and mathematical basis of the procedure. DOE

N83-13595# National Bureau of Standards, Washington, D.C.
TI-59 PROGRAM FOR CALCULATING THE ANNUAL ENERGY REQUIREMENTS FOR RESIDENTIAL HEATING AND COOLING. VOLUME 2: PROGRAM REFERENCE MANUAL
T. Kusuda, F. A. Costello, S. T. Liu, and J. P. Barnett Jul. 1982 235 p 2 Vol.
(Contract DE-AI01-76PR-06010)
(DE82-020275; DOE/NBB-0011-Vol-2) Avail: NTIS HC A11/MF A01

Basic mathematical formulation, program listing, and input data for the subject pocket calculator energy analysis procedure are given. The data include solar and surface weather parameters, degree-days to variable bases, sunlit factors and Earth temperature. DOE

N83-13596# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE CRITERIA FOR PHOTOVOLTAIC ENERGY SYSTEMS, VOLUME 1
G. Nuss, R. DeBlasio, S. Forman, A. Hoffman, S. Hogan, P. Longrigg, H. Post, R. Ross, and H. Schafft Jul. 1982 179 p 2 Vol.
(Contract DE-AC02-77CH-00178)
(DE82-021958; SERI/TR-214-1567-Vol-1) Avail: NTIS HC A09/MF A01

The state of the art in defining performance criteria for photovoltaic (PV) systems and their components the PV array,

power conditioning, monitor and control, and storage subsystems, cabling, and power distribution is presented. Each performance criterion consists of a criterion statement, an evaluation statement and a commentary statement. Performance criteria deal with: electrical, thermal, mechanical/structural, safety, durability/reliability, installation, operation and maintenance, and building and site characteristics. The performance criteria are not prescriptive; they are performance oriented to allow for innovation and for a variety of approaches to obtain desired objectives for a PV system or subsystem. A glossary is presented with definitions relevant to photovoltaic subsystems. DOE

N83-13597# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE CRITERIA FOR PHOTOVOLTAIC ENERGY SYSTEMS, VOLUME 2
G. Nuss, R. DeBlasio, S. Forman, A. Hoffman, S. Hogan, P. Longrigg, H. Post, R. Ross, and H. Schafft Jul. 1982 242 p ref 2 Vol.
(Contract DE-AC02-77CH-00178)
(DE82-021683; SERI/TR-214-1567-Vol-2) Avail: NTIS HC A11/MF A01

A unified body of test procedures for the evaluation of photovoltaic subsystem performance criteria was established. The test methods represent recommended evaluation procedures, but they are not consensus standards tests. The tests address electrical, thermal, mechanial, and durability aspects of the solar cell array, and the electrical aspects of the power conditioning subsystem and battery storage subsystem. DOE

N83-13598# Allen (Eliot) and Associates, Inc., Salem, Oreg.
GUIDE TO A GEOTHERMAL HEAT PLAN: A GEOTHERMAL ENERGY APPLICATION, SERIAL NO. 3
Mar. 1982 39 p refs Sponsored in cooperation with Oregon Dept. of Energy Prepared for Washington State Energy Office, Olympia
(Grants DE-FG07-79RO-00079; DE-FG51-79RO-00079)
(DE82-020591; WAOENG-82-04) Avail: NTIS HC A03/MF A01

An atlas systematically monitors a community's thermal supplies and demands, and catalogs them in the same manner as other community development sectors. The heat plan contains thermal goals and implementation measures based on conditions and opportunities revealed in the atlas. The heat demands considered in the atlas include space, water, and industrial process heat demands. Thermal resources considered include those conventional fuels already in use, as well as those alternate energy resources which have potential for utilization. DOE

N83-13599# Sandia Labs., Albuquerque, N. Mex.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT FOR CDC LIGHT MANUFACTURING BUILDING, SAN BERNARDINO, CALIFORNIA
Aug. 1982 25 p Prepared in cooperation with Boeing Computer Services Co.
(Contract DE-AC04-76DP-00789)
(DE82-020883; SAND-81-7089/3) Avail: NTIS HC A02/MF A01

The data accumulated during May at the intermediate photovoltaic project at the CDC Light Manufacturing Bldg., San Bernardino, California are presented. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities which are not attributable to weather are provided. DOE

N83-13600# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTROCHEMICAL STORAGE CELL BASED ON POLYCRYSTALLINE SILICON Final Report, 1 Mar. 1981 - 1 Mar. 1982
D. Canfield and S. R. Morrison 28 Feb. 1982 56 p refs
(Contract DE-AC03-76SF-00098)
(DE82-020595; LBL-14639) Avail: NTIS HC A04/MF A01

Theoretical and experimental investigations on the performance of n and p type silicon in solution for efficient solar energy conversion were conducted. Part of the work sought to identify redox couples capable of inducing maximum band bending (highest open circuit voltage) and limit the corrosion for both n and p type silicon. High photovoltages were obtained by using vanadium (II/III) and ferrocene/ferricinium couples for p type and n type silicon respectively. These couples demonstrated reasonable stability, but their efficiency was limited by the growth of a relatively thick insulating SiO2 corrosion layer. Corrosion studies were performed to evaluate the use of HF to remove the corrosion layer and to consider the interaction between HF and the redox couple. Much of the experimental and theoretical work focused on the effect of the surface oxide on solar cell characteristics and led to a variety of surface treatments aimed at improving the fill factor of silicon photoelectrochemical cells. The surface treatments included high temperature annealing of the normal oxide under an argon or hydrogen atmosphere, coating a p n junction with a thin layer of platinum, and passivation with poly-vinylcarbazole polymer. DOE

N83-13601# Battelle Columbus Labs., Ohio.
CONVERSION OF FOREST RESIDUES TO A METHANE-RICH GAS IN A HIGH-THROUGHPUT GASIFIER
H. F. Feldman, M. A. Paisley, D. W. Folsom, and B. C. Kim 31 Oct. 1981 60 p refs
(Contract W-7405-eng-92)
(DE82-020289; BMI-2907) Avail: NTIS HC A04/MF A01

Results of the experimental work conducted thus far show that wood can be readily gasified in a steam environment into a hydrocarbon rich fuel gas that can be used as a replacement for petroleum based fuels or natural gas with minimal boiler retrofit. Further, this conversion can be achieved in a compact gasification reactor with heat supplied by a circulating entrained phase, thereby eliminating the need for an oxygen plant. Tars were found except at the lowest gasifier temperatures employed, and therefore heat recovery from the product gas should be much simpler than that from commercially available fixed bed gasification systems where product gas contains significant quantities of tar. The data generated were used in a preliminary conceptual design. Evaluation of this design shows that a medium Btu gas can be produced from wood at a cost competitive with natural gas or petroleum based fuels. DOE

N83-13602# Oklahoma Univ., Norman. School of Chemical Engineering and Materials Science.
DEVELOPMENT OF GEOTHERMAL BINARY-CYCLE WORKING-FLUID PROPERTIES: INFORMATION AND ANALYSIS OF CYCLES Final Report
K. E. Starling, Z. I. Malik, and C. T. Chu 30 Sep. 1981 7 p refs
(DE82-021542; DOE/ID-01719/5) Avail: NTIS HC A02/MF A01

Efforts were directed principally to the following tasks: (1) comparisons of mixture and pure fluid cascade cycles, (2) development of guidelines for working fluid selection for single boiler cycles, (3) continued evaluation of mixtures as working fluids, (4) working fluid thermophysical property correlation and presentation of properties information, (5) support to the INEL Conversion Technology Program. DOE

N83-13603# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
AN OVERVIEW OF SOLAR INDUSTRIAL PROCESS-HEAT (SIPH) APPLICATIONS BELOW 120 DEG C
Frank Kreith and Roger Davenport Nov. 1981 37 p refs
(Contract DE-AC02-77CH-00178)
(DE82-021360; SERI/TR-252-1438) Avail: NTIS HC A03/MF A01

An overview of solar industrial process heat (SIPH) technologies and economics for applications below 1200 C is given and a procedure for optimally matching solar systems to industrial energy requirements is outlined. Cost and system performance of operational SIPH installations are summarized, and steps required to reduce the cost of the energy delivered by future SIPH systems are presented. DOE

N83-13604# Sandia Labs., Livermore, Calif.
SOLAR COGENERATION
Apr. 1982 20 p refs

(Contract DE-AC04-76D-00789)
(DE82-019085; DOE/NBM-2019085) Avail: NTIS HC A02/MF A01

After a brief introduction to the operational principles and advantages of solar cogeneration, seven cogeneration studies are summarized covering such applications as sulfur mining, copper smelting, enhanced oil recovery, natural gas processing, sugar mill operations, and space heating and cooling. For each plant is given a brief site description, project summary, conceptual design, and functional description, including a picture of the facility and a flow chart. Also listed are the addresses of the companies involved for obtaining additional information. DOE

N83-13605# Great Plains Gasification Association, Detroit, Mich.
GREAT PLAINS GASIFICATION PROJECT Technical Progress Report, quarter ending 30 Jun. 1982
30 Jul. 1981 61 p
(Contract DE-FM02-82FE-55014)
(DE82-019500; DOE/FE-55014/T1) Avail: NTIS HC A04/MF A01

For the quarter ending June 30, 1982, engineering was on schedule for the Mine and slightly behind schedule for the Plant. There are no major engineering problems which would foreseeably impact the scheduled start up date for production. There were no major engineering changes for the quarter which would affect the technical baseline. Engineering for the next quarter will be directed to supporting the remaining portion of the summer construction schedule, completing the civil/structural design work, maintaining a high level of production for piping drawings and making significant progress in the electrical/instrument areas. DOE

N83-13606# Hittman Associates, Inc., Columbia, Md.
EVALUATION OF ESTIMATED ENERGY CONSERVATION MEASURE COSTS AND BENEFITS IN THE RESIDENTIAL MULTIFAMILY SECTOR Final Report
Sep. 1982 119 p refs
(Contract DE-AC01-79PE-70044)
(DE82-000490; DOE/PE-70044/T5) Avail: NTIS HC A06/MF A01

Supporting data for a policy review to determine how the multifamily buildings subsector is responding to market signals was sought. What role, if any, the federal government should play in encouraging conservation in multifamily buildings is discussed. The policy review seeks to develop an understanding of the current level of and trends in energy conservation activity in multifamily housing. The availability of the required data is determined and information in a form which facilitates its use by policy analysts is compiled. The results are presented in four parts. Part I provides an overview. Part II presents, in tabular form, the cost of selected retrofit items and the resulting energy and cost savings. As an aid to understanding the data in Part II, the salient assumptions underlying the data are also included in this part. Part III describes how the data in Part II were developed. DOE

N83-13607# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 8: DESIGN APPROACHES - UPH. APPENDIX B: SHAFTS Final Report
Apr. 1981 92 p Sponsored by EPRI
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028202; EPRI-EM-1589-Vol-8-App-B;
DOE/ET-5047-Vol-8-App-B) Avail: NTIS HC A05/MF A01

An assessment of shaft requirements for an underground pumped hydroelectric (UPH) facility is documented. Shaft requirements for both the construction and the permanent operation phases of the facility are outlined. Possible shaft arrangements are developed and the design of shaft linings is discussed. Methods of shaft sinking are reviewed. Alternative schedules for the sinking of the shafts are described and a preferred schedule selected. The material presented and also the cost estimates are based on the requirements for a 2000 MW plant providing 20,000 MWh of storage with a nominal head of 4600 ft. Studies subsequently carried out, including power plant design, head optimization analyses for the overall UPH surface and underground configuration, and further refinement of selected designs, have modified some of the material given. DOE

N83-13608# Naemnden foer Energiproduktionsforskning, Stockholm (Sweden).
INTERACTION IN LIMITED ARRAYS OF WINDMILLS
C. Crafoord Mar. 1979 54 p refs
(DE82-750056; NE/VIND-80/39) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The problem of how closely packed an array of windmills can be erected without unduly interfering with each other was investigated. Earlier results for neutral stratification are presented in a slightly different manner, more fully illustrating the tradeoff between windmill density and mean efficiency as function of group size. A variation in mean efficiency of 13% for a group with 80 units, which may correspond to a factor of 2.5 in area coverage is indicated. A dynamic one dimensional planetary boundary layer (PBL) model is presented and redesigned for simulation experiments. The regeneration of the wind profiles behind a windmill unit is studied for different ambient conditions. A variation of up to a factor of 9 in the rate of regeneration of the profiles was found. The use of a statistical approach with lateral homogenization of the wind profiles is discussed. DOE

N83-13609# Argonne National Lab., Ill.
OPTIMAL SIZING OF HEATING SYSTEMS THAT STORE AND USE THERMAL ENERGY
H. N. Hersh Jun. 1981 59 p refs
(Contract W-31-109-eng-38)
(DE82-003011; ANL/SPG-18) Avail: NTIS HC A04/MF A01

An analysis of the factors that enter into the sizing of thermal energy storage (TES) space heating systems is given. These TES systems, having to fulfill the same thermal comfort functions as conventional space heating systems, have different operating characteristics and more severe constraints, and therefore require different and more critical sizing procedures. Thermal energy storage heating systems offer social and private benefits, and the achievement of these benefits depends in large part on proper sizing. Proper sizing is a probabilistic rather than a deterministic procedure, and is utility-specific as well. Analysis of experimental data obtained in field studies of TEST in New England provided information on the accuracy of equipment-sizing procedures used by vendors and on the consequences of undersizing and oversizing. Based on simulation studies and other techniques, additional useful sizing information was developed. The information implies the need for an upward adjustment of the sizing factor if the sizing is to be optimal for US climatological conditions and living habits. A summary and a general theoretical analysis of the information presented in this report are then combined to provide guidelines for optimally sizing TES systems. DOE

N83-13610# Public Service Co. of Indiana, Plainfield.
COMPRESSED-AIR ENERGY STORAGE PRELIMINARY DESIGN AND SITE-DEVELOPMENT PROGRAM IN AN AQUIFER. VOLUME 1: EXECUTIVE SUMMARY Final Report
Jun. 1982 129 p Sponsored by Electric Power Research Inst. Prepared in cooperation with Sargent and Lundy Engineers, Chicago and Westinghouse Electric Corp., Concordville, Pa. 9 Vol.
(Contract DE-AC02-78ET-29232; EPRI Proj. 1081-3)
(DE82-019284; EPRI-EM-2351-Vol-1) Avail: NTIS HC A07/MF A01

The behavior and suitability of an aquifer-based compressed-air energy storage (CAES) facility was investigated. Project organization, site selection, aquifer geology, plant design, turbomachinery, and cost analysis are addressed. DOE

N83-13611# Public Service Co. of Indiana, Plainfield.
COMPRESSED-AIR ENERGY STORAGE PRELIMINARY DESIGN AND SITE-DEVELOPMENT PROGRAM IN AN AQUIFER. VOLUME 2: UTILITY-SYSTEM PLANNING Final report

Jun. 1982 111 p refs
(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. 1081-3)
(DE82-019993; EPRI-EM-2351-Vol-2) Avail: NTIS HC A06/MF A01

The benefits derived from the integration of a compressed air energy storage facility with a hypothetical electrical network were analyzed. The analysis was based on three study scenarios each having a target generation mix of 65% base, 25% intermediate, and 10% peaking capacity. Scenarios of 100% coal, 50% coal and 50% nuclear, and 100% nuclear base load capacity additions were examined. Final results of the analyses indicate favorable economics when compressed air energy storage is installed as an alternative to combustion turbine peaking capacity on a system with a significant amount of oil-fired generation. DOE

N83-13612# Gould, Inc., Rolling Meadows, Ill.
DEVELOPMENT OF ZINC BROMIDE BATTERIES FOR STATIONARY ENERGY STORAGE Final Report, Nov. 1979 - Dec. 1981
R. A. Putt and A. Attia Jul. 1982 114 p Sponsored by Electric Power Research Inst.
(Contract DE-AC02-78ET-29345; EPRI Proj. 635-2)
(DE82-019283; EPRI-EM-2497) Avail: NTIS HC A06/MF A01

The principal objective was to build and test for 50 cycles a 10-kW, 80-kWh prototype battery of the bipolar design with large electrodes (30 cm x 30 cm). Secondary objectives were to continue long-term studies on improvements in materials and processing and on life cycling of small laboratory cells. Secondary objectives were to continue long-term studies on improvements in materials and processing and on life cycling of small laboratory cells. The 80-kWh design was successfully constructed and tested, running 59 consecutive cycles from its first startup. The forced outage rate was zero, and the total downtime for repair and maintenance was 9.6 hours out of the 1728 elapsed-time hours. The system was operated at full power, but not at full capacity (design levels of 10 kW for 8 h). Energy efficiency was above 60% in the early cycles. The present design is the first of its kind and far from having optimum characteristics of the most suitable materials. Achievements of 70 to 75% electrochemical energy efficiency is believed to be feasible. DOE

N83-13613# California Univ., Berkeley. Lawrence Berkeley Lab. Energy Performance of Buildings Group.
COMPUTERIZED INSTRUMENTED RESIDENTIAL AUDIT, VERSION 1.0. SOURCE LISTINGS
Jun. 1982 183 p
(Contract DE-AC03-76SF-00098)
(DE82-019953; LBL-PUB-448) Avail: NTIS HC A09/MF A01

The CIRA is a set of computer programs to predict the energy consumption of small buildings. It also provides an optimized list of improvements which reduce energy use. The source code in BASIC is provided to help a user adapt the program to a particular application, or to see details of the calculation algorithms. DOE

N83-13614# California Univ., Berkeley. Dept. of Nuclear Engineering.
USE OF WASTE HEAT IN DISTRICT SYSTEMS WITH CONSIDERATIONS OF SEASONAL-HEAT-DEMAND VARIATIONS
R. T. Mahini and V. E. Schrock Jun. 1982 116 p refs
(Contract DE-AT03-79ET-15391)
(DE82-019923; UCB-NE-4022) Avail: NTIS HC A06/MF A01

The use of waste heat in district heating systems and considerations of seasonal heat demand variations were studied. The system employs heat pumps stationed throughout an urban center to use the waste heat from a power plant condenser coolant as their heat source and to deliver hot water in the consumer pipe line. The water from the power plant is circulated in a closed loop between the heat pump's evaporator and the power plant's condenser. The water in the distribution pipeline circulates in another closed loop between the heat pump's condenser and the consumer heat exchanger units. The city of Philadelphia was used as the reference city for population density and climatic conditions. The cost of system was calculated under various circumstances. The parameters varied were the distance between the power plant and the heat pump stations, the temperature drop of the main line water in the heat pump's evaporator, the approach temperature of the heat exchanger in the district station, the annual heat load, and the monthly variations of the heat demand. The cost of the system was computed to be between 16 to 31 mills/kwhr depending on the operating condition. DOE

N83-13615# Trinity Univ., San Antonio, Tex.
DEVELOPMENT OF THE TRICKLE ROOF COOLING AND HEATING SYSTEM: EXPERIMENTAL PLAN
P. Haves, T. Jankovic, and E. Doderer Jul. 1982 62 p refs
(Contract DE-AC03-79CS-30201)
(DE82-019082; DOE/CS-30201-T9) Avail: NTIS HC A04/MF A01

A passive system applicable both to retrofit and new construction was developed. This system (the trickle roof system) dissipates heat from a thin film of water flowing over the roof. A small scale trickle roof system dissipator was tested at Trinity University under a range of ambient conditions and operating configurations. The results suggest that trickle roof systems should have comparable performance to roof pond systems. Provided is a review of the trickle roof system concept, several possible configurations, and the benefits the systems can provide. Test module experiments And results are presented in detail. The requirements for full scale testing are discussed and a plan is outlined using the two identical residential scale passive test facility buildings at Trinity University, San Antonio, Texas. Full scale experimental results would be used to validate computer algorithms, provide system optimization, and produce a nationwide performance assessment and design guidelines. This would provide industry with the information necessary to determine the commerical potential of the trickle roof system. DOE

N83-13616# County of Orange, Santa Ana, Calif.
ACCEPTANCE-TEST REPORT FOR EL TORO LIBRARY SOLAR HEATING AND COOLING DEMONSTRATION PROJECT (SHAC NO. 1501)
30 Mar. 1982 92 p
(Contract DE-FC03-77CS-31501)
(DE82-019859; DOE/CS-31501-T1) Avail: NTIS HC A05/MF A01

The results from arious mode acceptance tests on the El Toro Library Solar Energy System, are presented. All the modes tested function as designed. Collector array efficiencies are calculated at approximately 40%. Chiller COP is estimated at .50, with chiller loop flow rates approximately 85 to 90% of design flow. The acceptance test included visual inspection, pre-operational testing and procedure verification, operational mode checkout, and performance testing. DOE

N83-13617# Battelle Columbus Labs., Ohio.
TOTAL ENERGY FOOD PLANT 21 MILLION GALLON ETHANOL FACILITY Final Report
Oct. 1981 571 p refs Prepared in cooperation with Chemapec, Inc., Woodbury, Ind. and Clark Dietz Engineers, Inc., Richmond, Ind. Prepared for Agri-Answer, Inc., Union City, Ind.
(Contract DE-FG07-80RA-50329)
(DE82-019258; DOE/RA-50329/1) Avail: NTIS HC A24/MF A01

The Phase I Engineering study includes the following: process description, waste water treatment plant, material summary, energy chart, capital cost estimate, equipment list, personnel requirements, drawings list, specifications list, and project schedule. The economic and financial feasibility of the technical process, and environmental, health, safety, and socio-economic assessments for the project are reported. The costs for extending the following utilities to the property line of the selected site are presented: potable water, sewer system, electricity, roads for truck traffic, and rail service. DOE

N83-13618# Science Applications, Inc., Palo Alto, Calif.
COMPUTER-SIMULATION CODE FOR THE PREDICTION OF

RELIABILITY AND AVAILABLE CAPACITY OF MODULAR ENERGY-STORAGE ARRAYS. VOLUME 1: OVERVIEW Final Report

S. L. Basin and R. D. Horn Aug. 1982 37 p Sponsored by Electric Power Research Inst. 2 Vol.
(EPRI Proj. 370-17)
(DE82-906445; EPRI-EM-2486-Vol-1) Avail: NTIS HC A03/MF A01

This report describes a computer simulation code that has been constructed for studying the reliability of arrays of energy storage components which are subject to renewal or repair. The measures of performance include: time to first failure of the array; time between successive failures; available capacity of the system (i.e., number of module hours available) between successive system failures as well as over the planned life of the system; number of system failures over the planned life of the systems; and number of module replacements over the planned life of the systems. At the present time the program is set up to handle two types of systems; simple systems consisting of series-parallel or parallel-series configurations of modules and compound systems in which the modules in the overall system array have been replaced y submodules, each having a series-parallel or parallel-series structure. The effect of periodic maintenance - e.g., the replacement of all failed modules every three or six months - may be studied in contrast to replacement of all failed modules at the time of each system failure. The program allows for the combination of both of the above maintenance policies. It is assumed that all failed modules or submodules within the system are replaced by new ones. DOE

N83-13619# *Cambridge Systematics, Inc., Berkeley, Calif.*
RESIDENTIAL END-USE ENERGY PLANNING SYSTEM (REEPS) Final Report

A. Goett and D. McFadden Jul. 1982 167 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1211-2)
(DE82-906444; EPRI-EA-2512) Avail: NTIS HC A08/MF A01

The Residential End-Use Energy Planning System (REEPS) is described. REEPS is a forecasting model of residential energy patterns that is capable of evaluating the impacts of a broad range of energy conservation measures. REEPS forecasts appliance installations, operating efficiencies, and utilization patterns for space heating, water heating, air conditioning, and cooking. Each of these decisions is sensitive to energy prices, mandatory policies, and household/dwelling and geographical characteristics. The parameters of these choice models have been estimated statistically from national household survey data. The structure of the choice models and the results of the statistical analysis are reported in detail. REEPS forecasts energy choices for a large number of market segments representing households with different socioeconomic, dwelling, and geographical characteristics. These segments reflect the joint distribution of characteristics in the population. Aggregate forecasts are generated by summing up the decisions for all population segments. This technique provides a consistent method of obtaining aggregate forecasts from disaggregate, nonlinear choice models. Moreover, it permits evaluation of the distributional impacts of prospective conservation policies. The results of simulation of REEPS are described. DOE

N83-13620# Geothermal Development Associates, Reno, Nev.
PRELIMINARY PLAN FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY IN THE TOWN OF HAWTHORNE, NEVADA

4 Nov. 1981 107 p refs
(DE82-904440; NP-2904440) Avail: NTIS HC A06/MF A01

Site characteristics pertinent to the geothermal development are described, including: physiography, demography, economy, and goals and objectives of the citizens as they relate to geothermal development. The geothermal reservoir is characterized on the basis of available information. The probable drilling depth to the reservoir, anticipated water production rates, water quality, and resource temperature are indicated. Uses of the energy that seem appropriate to the situation both now and in the near future at Hawthorne are described. The essential institutional requirements for geothermal energy development are discussed, including the financial, environmental, and legal and regulatory aspects. The various steps that are necessary to accomplish the construction of the geothermal district heating system are described. DOE

N83-13621# Geothermal Development Associates, Reno, Nev.
PRELIMINARY PLAN FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY IN THE TOWN OF GABBS, NEVADA

Nov. 1981 104 p refs
(DE82-904441; NP-2904441) Avail: NTIS HC A06/MF A01

Characteristics of the site significant to the prospect for geothermal development are described, including: physiography, demography, economy, and the goals and objectives of the citizens as they relate to geothermal development. The geothermal resource evaluation is described, including the depth to reservoir, production rates of existing water wells, water quality, and the resource temperature. Uses of the energy that seem apropriate to the situation both now and in the foreseeable future at Gabbs are described. The essential institutional requirements for geothermal energy development are discussed, including the financial, environmental, legal, and regulatory requirements. The main resource, engineering and institutional considerations involved in a geothermal district heating system for Gabbs are summarized. DOE

N83-13622# Bechtel Corp., San Francisco, Calif.
PHOTOVOLTAIC BALANCE-OF-SYSTEM ASSESSMENT Final Report

Jun. 1982 136 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1975-2)
(DE82-906429; EPRI-AP-2474) Avail: NTIS HC A07/MF A01

The balance-of-system (BOS) status is assessed for photovoltaic power systems. The BOS includes all subsystems and components, except cells and modules, needed for a fully functional power system. The objectives of the study include status assessment and installed cost estimation for BOS subsystems and components, and estimates of system operation and maintenance requirements. The assessment was carried out for representative central station, intermediate, and residential applications. Array types evaluated include: flat plate and Fresnel lens concentrator for the central station; ground- and roof-mounted flat plate, and Fresnel lens and north-south parabolic trough concentrators for intermediate applications; and integral and direct-mounted flat plate for residential applications. Active and passive cooling are considered for central station and intermediate applications. Battery energy storage is included as an option for intermediate and residential applications. Results of the study indicate that array structures and power conditioning subsystems are major BOS cost elements. DOE

N83-13623# Electric Power Research Inst., Palo Alto, Calif. Advanced Power Systems Div.
ELECTRIC-UTILITY SOLAR-ENERGY ACTIVITIES: 1981 SURVEY

Elizabeth Baccelli and Karen Gordon Jul. 1982 318 p
(DE82-905804; EPRI-AP-2516-SR) Avail: NTIS HC A14/MF A01

Presented are the results of a survey to determine the scope of electric participation in solar energy projects in the United States. Brief descriptions are given of 943 projects being conducted by 236 utility companies. An index of projects by category, a statistical summary, a list of participating utilities with information contacts and addresses, a list of utilities with projects organized by technology, a list of utilities organized by state, a list of available reports on utility-sponsored projects, and a list of projects having multiple utility participants are included. DOE

N83-13624# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW

Oct. 1981 33 p refs
(Contract W-7405-eng-48)
(DE82-002076; UCRL-52000-81-10) Avail: NTIS

HC A03/MF A01
Research is described in three areas, high technology design of unconventional, nonnuclear weapons, a model for analyzing special nuclear materials safeguards decisions, and a nuclear weapons accident exercise (NUWAX-81). DOE

N83-13625# Sandia Labs., Albuquerque, N. Mex.
FORCED VIBRATION ANALYSIS OF ROTATING STRUCTURES WITH APPLICATION TO VERTICAL AXIS WIND TURBINES
D. W. Lobitz 1981 22 p refs Presented at the 5th Biennial Wind Energy Conf. and Workshop, Washington, D. C., 5 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-000620; SAND-81-2141C; CONF-811043-1) Avail: NTIS HC A02/MF A01

Predictive methods for the dynamic analysis of wind turbine systems are important for assessing overall structural integrity and fatigue life. For the former, the identification of resonance points (spectral analysis) is of primary concern. For the latter forced vibration analysis is necessary. These analyses are complicated by the fact that, for a spinning turbine, the stress-producing deformations take place in both fixed and rotating reference systems simultaneously. As an example, the tower of a horizontal axis wind turbine (HAWT) must be analyzed in a fixed frame, and the rotor in a rotating one. Forced vibration analysis is further complicated in that accurate models need to be developed for aeroload prediction. Methods which are available for forced vibration analysis of both horizontal and vertical axis machines are identified and the method which was developed for vertical axis wind turbines is emphasized, with some comparisons of the predictions to experimental data. DOE

N83-13626# Toulouse Univ. (France).
THE REDUCTION OF RADIATION DAMAGE IN SOLAR CELLS. A STUDY OF RADIATION DEFECTS IN SILICON, FIRST PHASE Final Report
Jacques Bernard (ONERA, Toulouse), Danielle Bielle-Daspet (Centre d'Etude Spatiale des Rayonnements), Jacques Bourgoin (Paris Univ. VII), and Luis Castaner Munoz (Gorge Girona Salgado SN) Paris ESA Jun. 1981 100 p refs
(Contract ESTEC-4510/80/NL-JS(SC))
(CESR-81-985; ESA-CR(P)-1617) Avail: NTIS HC A05/MF A01

Research on space environmental flux and simulation of spatial conditions, defects induced by electron and proton radiation, and photon effects, in n and p-type silicon, microscopic and macroscopic measurement techniques for the study of defect properties and lifetime degradation in silicon solar cells, and numerical models for space solar cell and degradation prediction was surveyed. Long term prediction of solar generator degradation is limited by an insufficient knowledge of the degradation mechanisms of the solar cells in space. In space, p-type silicon behaves better than n-type. Lithium introduction in n-type silicon gives improvement only in particular structures. The role that lithium plays is difficult to identify and the time stability of lithium doped cells is uncertain. The major effects of photon degradation appear to be related to the presence of boron when the oxygen and carbon contents of the material are simulatenously low.
Author (ESA)

N83-13627# United Kingdom Atomic Energy Authority, Harwell (England).
SECONDARY BATTERY REQUIREMENTS FOR SPACE USE IN THE LATE 1980'S 1990'S Final Report
J. Hyatt Paris ESA Apr. 1982 274 p refs
(Contract ESTEC-4404/80/NL-JS(SC))
(HL82/1200; ESA-CR(P)-1637) Avail: NTIS HC A12/MF A01

Secondary batteries, reverisble fuel cells and energy storage wheels were assessed. It is found that there is no system being developed for terrestrial applications that offers any potential to the space user, in low Earth orbits, better than the nickel/hydrogen and silver/hydrogen cells being developed specifically for space. The advanced high temperature cells (the sodium/sulfur cells in particular) do offer potential for development to give a lighter battery in geosynchronous Earth orbit. Author (ESA)

N83-13628# Stockholm Univ. (Sweden). Inst. of Physics.
SOME COMMENTS ON THE WORLD ENERGY CONFERENCE (WEC) ENERGY DEMAND MODEL
Lars Brandell (Royal Inst. of Tech., Stockholm) Apr. 1982 15 p refs
(USIP-82-04) Avail: NTIS HC A02/MF A01

The WEC model, relating the energy demand for a region in a year to gross national product (GNP), aggregated energy prices and elasticity constants, is generalized. The changes that result from the assumption that the elasticity factors are not constant are examined. The resulting differential equation contains the variables energy demand per capita and GNP per capita for the region considered. The effect of time lag in energy demand and the influence of the population growth rate are also included in the model. No projections of the future energy demand were made, but model sensitiveness to the modifications were studied. Time lag effects and population growth effects can raise the projected energy demand for a region by 10% or more. Author (ESA)

N83-13629# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
EXPERIMENTAL RESULTS OF A NONCONVENTIONAL ENERGY CONVERSION PILOT FACILITY-THERMOGRAVIMETRIC SYSTEM
S. Arosio (Politec. di Milan), M. Balestri (Ente Nazl. per l'Energia Elect., Pisa, Italy), F. Bonfanti, and G. Sotgia (Politec. di Milan) 1981 20 p refs Presented at 4th Intern. Conf. on Alternative Energy Sources, Miami, 14-16 Dec. 1981
(Contract ENEL-39/600)
(CISE-1754) Avail: NTIS HC A02/MF A01

The experimental analysis of a freon-water two-phase thermogravimetric pilot plant is presented. A comparison with mathematical models, developed for the determination of the geometric characteristics, component sizing, and off design performances of the thermogravimetric systems are also delineated. The pilot plant instrumentation and data acquisition system are described. A subroutine supplies the partial balance of the various plant components, the overall energy balance of the whole system and a preliminary analysis of the main characteristics of the two-phase flow. Curves showing the output power as a function of the actual design ratios of freon flow and hydraulic pressure drop are presented. The flow dynamic characteristics of the two-phase mixture are discussed. Author (ESA)

N83-13630# National Materials Advisory Board, Washington, D.C.
AN ASSESSMENT OF THE INDUSTRIAL ENERGY CONSERVATION PROGRAM, VOLUME 2 Final report, Nov. 1980 - Apr. 1982
May 1982 191 p refs
(Contract DE-AC01-80CS-40298)
(PB82-225780; NMAB-395-2) Avail: NTIS HC A09/MF A01 CSCL 10A

Industrial operations in the United States consume some 37 percent of the country's total energy, and it was estimated that this percentage will increase to 50 percent by 1990 unless appropriate conservation measures are applied. However, such measures are difficult to implement in spite of the potential offered by various technologies. Accordingly, a federal program was started in 1975 designed to mitigate the economic, technological, and institutional uncertainties via forms of government-industry partnership arrangements. The National Materials Advisory Board was requested in June 1980 to form a study committee to assess the effectiveness of the Industrial Energy Conservation Program which is administered by the Department of Energy. GRA

N83-13631# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
ESTIMATION OF RESOURCE AND RESERVES Final Report
Morris A. Adelman, John C. Houghton, Gordon Kaufman, and Martin

Zimmerman Mar. 1982 533 p refs Sponsored in part by Electric Power Research Inst.
(PB82-230954; MIT/EL-82-010) Avail: NTIS HC A23/MF A01 CSCL 10A

The economics of resource and reserve estimation are analyzed. The economic theory of natural resources and exhaustible resources are discussed. The measurement of already discovered deposits, undiscovered deposits, coal resource and reserve estimation, uranium, and a cumulative cost curve are also discussed. Author (GRA)

N83-13632# National Bureau of Standards, Washington, D.C. Building Equipment Div.
A COMPARISON OF UNGLAZED FLAT PLATE LIQUID SOLAR COLLECTOR THERMAL PERFORMANCE USING THE ASHRAE STANDARD 96-1980 AND MODIFIED BSE TEST PROCEDURES
John P. Jenkins and Kent A. Reed May 1982 36 p refs Sponsored in part by DOE
(PB82-237660; NBSIR-82-2522) Avail: NTIS HC A03/MF A01 CSCL 10A

The report reviews the BSE procedure and summarizes the ASHRAE Standard 96-1980 for testing unglazed solar collectors. The ASHRAE procedure consists exclusively of outdoor testing, whereas the BSE procedure requires a combination of outdoor and indoor testing (no irradiation) to determine the collector optical and thermal loss characteristics, respectively. Two unglazed flat plate liquid solar collectors were tested according to ASHRAE Standard 96-1980 and BSE procedures and the results compared. During the indoor BSE thermal loss tests blowers were used to simulate winds of 0-3.9 m/s(0-8.72 mi/hr) to investigate the wind effect upon collector thermal losses. Author (GRA)

N83-13633# Gamze-Korobkin-Caloger, Inc., Chicago, Ill.
THE 40kW FUEL CELL FIELD TEST SUPPORT Final Report, Mar. 1980 - May 1981
J. A. Orlando and M. G. Gamze Feb. 1982 66 p refs
(Contract GRI-5041-344-0192)
(PB82-231630; GRI-80/0101) Avail: NTIS HC A04/MF A01 CSCL 10B

GRI and the gas utilities are supporting a field test as one step forward in the commercialization of fuel cells. Broad programmatic oriented activities conducted by GKC include: preparation and presentation of a seminar on guidelines for use by individual utilities, first in the screening of candidate sites and then for use in the design of the fuel cell site mechanical and electrical interfaces; performance of an error analysis for site instrumentation; and participation in the GRI/utility review of the UTC development of a fuel cell Add-On Package which will allow grid connected 40 kW units. GKC also provided consulting support to individual utilities. Author (GRA)

N83-13634# National Materials Advisory Board, Washington, D.C.
ASSESSMENT OF RESEARCH NEEDS FOR ADVANCED BATTERY SYSTEMS Final Report
May 1982 197 p refs
(Contract DOE-ET-78-C-01-3431)
(PB82-227349; NMAB-390) Avail: NTIS HC A09/MF A01 CSCL 10C

The materials related research needs for advanced rechargeable storage battery systems were assessed. Both aqueous and nonaqueous systems, to be used primarily in electric vehicles and electric utility load leveling applications, were examined. It is concluded that research is needed on a wide spectrum of components and processes to improve the performance of such systems. Additionally, many of the problems are common to several types of battery cells; research on these generic problems warrants special priority. An overview of the state of the art is provided along with a summary of recommendations, particularly concerning generic problems with storage batteries but also including those unique to individual systems. An outline of research needs is presented. GRA

N83-13635# Swedish Council for Building Research, Stockholm.
SEASONAL THERMAL STORAGE: SWEDISH PRACTICE, DEVELOPMENTS AND COST PROJECTIONS
Peter Margen 1981 33 p refs
(PB82-232331; D4:1981) Avail: NTIS HC A03/MF A01 CSCL 10C

The types of heat store being developed in Sweden for seasonal storage of heat are discussed. This type of storage allows summer excess heat from industrial waste heat plants, garbage burning plants and future central solar heat stations to be stored for winter use on district heating networks. Whereas above ground steel or concrete tanks are usually too expensive insulated earth pits, uninsulated rock caverns and deep ground schemes using rock or clay promise to achieve sufficiently low costs to justify storage when supplied with free or cheap summer treat. For all these concepts demonstration plants were or are being built in Sweden. GRA

N83-13636# Bureau of Mines, Denver, Colo. Research Center.
EVALUATION OF A SHEATHED PERMISSIBLE EXPLOSIVE CHARGE FOR OPEN SHOOTING IN FLAMMABLE ATMOSPHERES: ADOBE CHARGE PROGRAM Technical Progress Report
Richard J. Mainiero and J. Edmund Hay Apr. 1982 14 p
(PB82-220732; BM-TPR-118) Avail: NTIS HC A02/MF A01 CSCL 08I

A prototype nonincendive explosive rock-breaker charge that can be fired unconfined in underground bituminous coal mines without the danger of igniting a flammable atmosphere that might be present is described. At present, unconfined shooting in underground coal mines is prohibited, but there are situations where the use of such shots would yield an overall improvement in safety. The charge consists of 1-1/2 lb of permissible water gel explosive in the form of a short cylinder 7 inches in diameter and 7/8 inches high, surrounded by a 1/2-inch-thick layer of damp salt, and encased in latex rubber reinforced with cheese cloth. The latex rubber housing provides a charge package that is strong enough to resist rough handling yet is pliable enough to conform to an irregular stone surface. A charge of this shape was found to be more effective at breaking rock than charges with lined or unlined cavities. GRA

N83-13637# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
STATIONARY FLYWHEEL ENERGY STORAGE SYSTEMS
A. Gilhaus, E. Hau, G. Gassner, G. Huss, and H. Schauberger Jul. 1982 111 p refs Transl. into ENGLISH from the mono. "Stationare Schwungrad-Energiespeicher" 1981 Sponsored in part by the Commission of the European Communities
(PB82-238130; EUR-7088-DE) Avail: NTIS HC A06/MF A01 CSCL 13I

A study intended to discover industrial applications of Stationary Flywheel Energy Accumulators. The economic value for the consumer and the effects on the power supply grid were investigated. A possibility for energy storage by flywheels exists where energy otherwise lost can be used effectively as in brake energy storage in vehicles. The future use of flywheels in wind power plants also seems to be promising. Attractive savings of energy can be obtained by introducing modern flywheel technology for emergency power supply units which are employed, for instance, in telecommunication systems. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-13638 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
DEVELOPMENT AND APPLICATION OF OCCUPATIONAL AND ENVIRONMENTAL HEALTH STANDARDS (S/EPS WORKSHOP)

John A. E. Hannum Mar. 1982 69 p refs Workshop held at Cocoa Beach, Fla., 17 Nov. 1981
(Contract N00024-81-C-5301)
(AD-A116680; CPIA-Publ-353) Avail: Issuing Activity CSCL 13/2

The development and application of occupational and environmental health standards for the many materials and chemical systems used or generated in propulsion-related activities are discussed. Regulatory activities of organizations and various international bodies are dicussed at length together with the standard setting activities. Specifically considered were the uses of each type of standard. Also considered was the Army's role in the development of environmental criteria valves for propulsion-unique problems. R.J.F.

N83-13639 National Inst. for Occupational Safety and Health, Rockville, Md.
INTERNATIONAL AND NATIONAL MECHANISMS FOR CONTROL OF ENVIRONMENTAL AND HEALTH HAZARDS FROM CHEMICALS AND THE ROLE OF CHEMICAL TOXIC EFFECTS REGISTERS IN SUPPORTING HAZARD CONTROL EFFORTS
Herbert E. Christensen *In* APL Develop. and Appl. of Occupational and Environ. Health Stds. (S/EPS Workshop) Mar. 1982 p 7-18 refs (For primary document see N83-13638 04-45)
Avail: Issuing Activity CSCL 13/2

The activities of both the international and national regulatory organizations with respect to their interests and accomplishments in the development of occupational health and safety standards for the control of chemical hazards in the work place are discussed. The use of a chemical data register as an aid in assessing hazards is discussed. R.J.F.

N83-13640 National Academy of Sciences - National Research Council, Washington, D. C. Assembly of Life Sciences.
ONGOING ACTIVITIES OF THE COMMITTEE ON TOXICOLOGY: DEVELOPMENT AND USE OF SPECIAL STANDARDS
Gordon W. Newell *In* APL Develop. and Appl. of Occupational and Environ. Health Stds. (S/EPS Workshop) Mar. 1982 p 19-34 refs (For primary document see N83-13638 04-45)
Avail: Issuing Activity CSCL 13/2

The development and application of special standards in industries using toxic substances are discussed. Short-term exposure situations are discussed. Factors to be evaluated in deciding on permissible short-term exposures are discussed. The delayed effects of chemical agents on humans are considered. R.J.F.

N83-13641 Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
ENVIRONMENTAL RESPONSIBILITIES, CLASSES OF EXPOSURES AND ONGOING R AND D ACTIVITIES
Jack C. Dacre *In* APL Develop. and Appl. of Occupational and Environ. Health Stds. (S/EPS Workshop) Mar. 1982 p 35-50 (For primary document see N83-13638 04-45)
Avail: Issuing Activity CSCL 13/2

To enable environmental standards or criteria to be established, toxicological data bases were generated for munitions compounds and other identified Army-unique pollutants. The methodology used for calculating water quality criteria and preliminary pollutant limit values was briefly outlined and some of the derived values were given. R.J.F.

N83-13642 Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex. Industrial Hygiene Branch.
AN INDUSTRIAL HYGIENIST'S VIEW: RELATIONSHIPS BETWEEN INDUSTRIAL HYGIENE SAMPLING, HUMAN EXPOSURE STANDARDS AND EXPERIMENTAL TOXICOLOGY
James C. Rock *In* APL Develop. and Appl. of Occupational and Environ. Health Stds. (S/EPS Workshop) Mar. 1982 p 51-64 refs (For primary document see N83-13638 04-45)
Avail: Issuing Activity CSCL 13/2

The practical consequences of implicity workplace exposure variability is discussed. The relationship between toxicodynamic time constants and the proper selection of both short-term and long-term exposure standards is discussed. The variability of airborne workplace contaminant concentrations is the feature which most clearly distinguishes occupational exposures from the typical exposure protocols of experimental toxicology. Nevertheless, permissible exposure limits are usually set by specifying a concentration which is not to be exceeded by the average exposure during a specified measurement period. At the present time, nearly every airborne contaminant has at least two exposure standards. The short standards are specified for observation periods ranging from seconds to 30 minutes and the long standards are specified for observation periods of 8 hours or longer. Intentional or not, the existence of two or more standards for each contaminant consitutes an implicit restriction on the amount of variability to be tolerated in the workplace environment. R.J.F.

N83-13643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WATER VAPOR MEASUREMENT SYSTEM IN GLOBAL ATMOSPHERIC SAMPLING PROGRAM, APPENDIX
David R. Englund and Thomas J. Dudzinski Nov. 1982 18 p refs
(NASA-TP-2051; E-1167; NAS 1.60:2051) Avail: NTIS HC A02/MF A01 CSCL 13B

The water vapor measurement system used in the NASA Global Atmospheric Sampling Program (GASP) is described. The system used a modified version of a commercially available dew/frostpoint hygrometer with a thermoelectrically cooled mirror sensor. The modifications extended the range of the hygrometer to enable air sample measurements with frostpoint temperatures down to -80 C at altitudes of 6 to 13 km. Other modifications were made to permit automatic, unattended operation in an aircraft environment. This report described the hygrometer, its integration with the GASP system, its calibration, and operational aspects including measurement errors. The estimated uncertainty of the dew/frostpoint measurements was + or - 1.7 Celsius. Author

N83-13644*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN ASSESSMENT OF GAS-SIDE FOULING IN CEMENT PLANTS
W. J. Marner Sep. 1982 109 p refs Sponsored in part by DOE
(NASA-CR-169513; JPL-Pub-82-83; NAS 1.26:169513;
DOE/ID-12138/2) Avail: NTIS HC A06/MF A01 CSCL 13B

The cement industry is the most energy-intensive industry in the United States in terms of energy cost as a percentage of the total product cost. An assessment of gas-side fouling in cement plants with special emphasis on heat recovery applications is provided. In the present context, fouling is defined as the buildup of scale on a heat-transfer surface which retards the transfer of heat and includes the related problems of erosion and corrosion. Exhaust gases in the cement industry which are suitable for heat recovery range in temperature from about 100 to 1300 K, are generally dusty, may be highly abrasive, and are often heavily laden with alkalies, sulfates, and chlorides. Particulates in the exhaust streams range in size from molecular to about 100 micrometers in diameter and come from both the raw feed as well as the ash in the coal which is the primary fuel used in the cement industry. The major types of heat-transfer equipment used in the cement industry include preheaters, gas-to-air heat exchangers, waste heat boilers, and clinker coolers. At the present time, the trend in this country is toward suspension preheater systems, in which the raw feed is heated by direct contact with the hot kiln exit gases, and away from waste heat boilers as the principal method of heat recovery. The most important gas-side fouling mechanisms in the cement industry are those due to particulate, chemical reaction, and corrosion fouling. Author

N83-13645*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF ION-INDUCED NUCLEATION MASS SPECTROMETRY IN THE ANALYSIS OF TRACE GASES EVOLVED FROM A POLYIMIDE FILM DURING THE THERMAL CURING

STAGES
Alphonso C. Smith Sep. 1982 15 p refs
(NASA-TM-84569; NAS 1.15:84569) Avail: NTIS HC A02/MF A01 CSCL 13B

Trace gases evolved from a polyimide film during its thermal curing stages have been studied using ion-induced nucleation mass spectrometry. The technique involved exposing the test gas sample to a low energy beta source and recording the masses of the ion-induced molecular clusters formed in the reaction chamber. On the basis of the experimentally observed molecular cluster spectra, it has been concluded that the dominant trace component had a molecular weight of 87 atomic mass units. This component has been identified as a molecule of dimethylacetamide (DMAC) which had been used as a solvent in the preparation of the test polyimide specimen. This identification has been further confirmed by comparing the spectra of the test gas sample and the DMAC calibration sample obtained with a conventional mass spectrometer. The advantages of the ion-induced nucleation mass spectrometer versus the conventional mass spectrometer are discussed. Author

N83-13646# Oak Ridge National Lab., Tenn.
PUBLICATIONS IN BIOMEDICAL AND ENVIRONMENTAL SCIENCES PROGRAMS, 1981
J. B. Moody, comp. Jul. 1982 248 p
(Contract W-7405-eng-26)
(DE82-019734; ORNL-5904) Avail: NTIS HC A11/MF A01

Presented are 698 references to articles in journals, books and reports published in the subject area of biomedical and environmental sciences during 1981. There are 520 references to articles published in journals and books and 178 references to reports. Staff members in the Biomedical and Environmental Sciences divisions have other publications not included in this bibliography; for example, theses, book reviews, abstracts published in journals or symposia proceedings, pending journal publications and reports such as monthly, biomonthly, and quarterly progress reports, contractor reports, and reports for internal distribution. This document is sorted by the division, and then alphabetically by author. The sorting by divisions separates the references by subject area in a simple way. The divisions represented in the order that they appear in the bibliography are Anaytical Chemistry, Biology, Chemical Technology, Information R and D, Health and Safety Research, Instrumentation and Controls, Computer Sciences, Energy, Engineering Technology, Solid State, Central Management, Operations, and Environmental Sciences. Indexes are provided by author, title and journal reference. GRA

N83-13647# Brookhaven National Lab., Upton, N. Y. Biomedical and Environmental Assessment Div.
A REFERENCE-MATERIAL SYSTEM FOR ESTIMATING HEALTH AND ENVIRONMENTAL RISKS OF SELECTED MATERIAL CYCLES AND ENERGY SYSTEMS
M. A. Crowther and P. D. Moskowitz Jul. 1981 120 p refs
(Contract DE-AC02-76CH-00016)
(DE82-019309; BNL-51563) Avail: NTIS HC A06/MF A01

Samples analyses and detailed documentation are presented for a Reference Material System (RMS) to estimate health and environmental risks of different material cycles and energy systems. Data inputs described include: end-use material demands, efficiency coefficients, environmental emission coefficients, fuel demand coefficients, labor productivity estimates, and occupational health and safety coefficients. Application of the model permits analysts to estimate fuel use (e.g., Btu), occupational risk (e.g., fatalities), and environmental emissions (e.g., sulfur oxide) for specific material trajectories or complete energy systems. Model uncertainty is quantitatively defined by presenting a range of estimates for each data input. Systematic uncertainty not quantified relates to the boundaries chosen for analysis and reference system specification. Although the RMS can be used to analyze material system impacts for many different energy technologies, it was specifically used to examine the health and environmental risks of producing four types of photovoltaic devices. DOE

N83-13648# Rockwell International Corp., Richland, Wash.
ASSESSMENT OF POTENTIAL VOLCANIC HAZARDS: PASCO BASIN, WASHINGTON
G. D. Johnpeer (Ertec Western, Inc., Long Beach, Calif.), D. Miller (Ertec Western, Inc., Long Beach, Calif.), and G. Goles (Oregon Univ., Eugene) Aug. 1981 35 p refs
(Contract DE-AC06-77RL-01030)
(DE82-019418; RHO-BW-CR-130P) Avail: NTIS HC A03/MF A01

A volcanic hazard assessment was performed for three time intervals by considering (1) the potential for renewed volcanism from three source areas (the Cascade Range, the Columbia Plateau, and the Basin and Range Provinces); and (2) the potential effects of future volcanic events on a 2 x 3 km repository sited 2 km beneath the surface of the Pasco Basin. Important parameters used in the assessment include recurrence intervals, geologic conditional probabilities, and expected outcomes. These parameters were characterized for each of the three potential source areas. To enhance the determination of these parameters, basaltic volcanism on the Columbia Plateau is compared with two other flood basalt sequences (Karroo and Deccan) to gain insight on recurrence intervals and the character of eruptions which may occur in the future. The potential for renewed volcanism from each of the three source areas is determined using the estimated eruption rates. Event networks are used to show the logical sequence of events that would follow if volcanism were to recur in any of the source areas analyzed. DOE

N83-13649# Marine Biological Lab., Woods Hole, Mass. Ecosystems Center.
EFFECTS OF OIL ON TUNDRA PONDS AND STREAMS Final Report, 1 Oct. 1978 - 30 Sep. 1980
J. E. Hobbie May 1982 13 p refs
(Contract DE-AC02-76EV-02989)
(DE82-018899; DOE/EV-02989/2) Avail: NTIS HC A02/MF A01

The effects of nutrient enrichment on an arctic tundra stream were studied in 1979 and 1980. The site was the Kuparuk River of the North Slope of Alaska. Concentrations of phosphorus and nitrogen in the river were extremely low, and phosphorus was indicated as the most important limiting nutrient. An artificial stream was set up to observe the effects of added nutrients on periphyton biomass and photosynthesis. The phosphorus and phosphorus plus nitrogen enrichments showed significant increase in algal growth and production over the controls. Nitrogen alone gave no stimulus. The effects of petroleum hydrocarbons on the decomposition of plant litter was observed in an experimental setup simulating conditions in Toolik Lake, Alaska. Overall microbial activity and heterotrophic activity ((14)C acetate uptake) indicated no significant short term effect after oil addition. In longer experiments, the decomposition rate of lignin and cellulose components of Carex was observed by following (14)C labelled compounds. DOE

N83-13650# Oak Ridge National Lab., Tenn.
ANALYSIS OF TREATED SLUDGES AND ASSOCIATED LEACHATES FROM COAL-CONVERSION FACILITIES
M. P. Maskarinec, D. K. Brown, R. S. Brazell, and R. W. Harvey 1981 21 p refs Presented at Natl. Am. Chem. Soc. Summer Meeting, N. Y., 23 Aug. 1981
(Contract W-7405-eng-26)
(DE82-001488; CONF-810813-14) Avail: NTIS HC A02/MF A01

The classification of a solid waste as to degree of hazard involves the qualitative and quantitative analysis of potentially toxic materials in the waste and, subsequently, determination of the mobility of these materials in the environment. Analytical methods for organic compounds in coal conversion solid wastes are developed, as well as procedures or assessing the mobility of these compounds in the environment. Analytical methods for solid wastes and sludges are divided into two categories: (1) extraction of organics from the sample, and (2) determination of the individual components in the extraction is crucial to the reliability of the analytical data. Methods such as Soxhlet extraction (1), ultrasonic extraction (2) steam distillation (3), and three phase extraction

systems were used for the analysis of target compounds in solid wastes. DOE

N83-13651# Saarberg-Fernwaerme G.m.b.H., Saarbruecken (West Germany).
SFW-FUNK PROCESS FOR GASIFICATION OF SOLID URBAN AND INDUSTRIAL WASTE Final Report, Jul. 1980
Horst Hummelsiep and Franz Heinrich Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 230 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-117; ISSN-0340-7608) Avail: NTIS HC A11/MF A01

The development and testing of an urban and industrial waste gasification plant are described. Domestic waste of different compostion, grain size and closeness of grain and rubber and wood were gasified at varying operating conditions (composition, quantity and constitution of the oxidant) with good results. Author (ESA)

N83-13652# Saarberg-Fernwaerme G.m.b.H., Saarbruecken (West Germany).
MEASURING PROGRAM FOR THE R AND D PROJECT ON GASIFICATION OF DOMESTIC AND INDUSTRIAL WASTES Final Report, Jun. 1981
Horst Hummelsiep and Erwin Loew Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 86 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-118; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

Domestic and industrial waste incoming and outgoing material flows were analyzed. Waste as input material, screened fine fraction, gas produced, crude gas condensate (part tar - part water), ash produced, circulating water cooling, water ashbowl, fine fraction eluate, ash eluate, and waste water were examined. Quantities, compositions, energy content and pollutant quota are determined. Energy and mass relationships are derived. Author (ESA)

N83-13653# Stockholm Univ. (Sweden). Dept. of Meteorology.
BIOGEOCHEMICAL PROCESSES AND CLIMATE MODELLING
Bert Bolin 10 Jun. 1982 35 p refs Submitted for publication
(Contract SWED-NSRC-E-EG-223-111)
(DM-39) Avail: NTIS HC A03/MF A01

Steady state features of the global biogeochemical cycles are reviewed, particularly turnover times for carbon in terrestrial and marine reservoirs and means for their determination. Evapotranspiration, surface albedo dependance on type of vegetation and moisture supply, photosynthesis and gaseous exchange between the atmosphere and plants and their role in modeling long-term changes of climate are analyzed. The role of the nutrient balance of the sea in climate change is discussed. It is shown that regional studies of major biomes are required to formulate dynamic models of these subsystems and arrive at adequate methods for including biogeochemical processes in climate models. A record of land surface changes due to man is also required. It is proposed that a data bank that includes data on such topics and simple models describing the response of the dominating ecosystems to climatic change, be developed. Author (ESA)

N83-13654# Environmental Research and Technology, Inc., Concord, Mass.
EPA COMPLEX TERRAIN MODEL DEVELOPMENT: FIRST MILESTONE REPORT, 1981 Interim Report, Jun. 1980 - Dec. 1981
T. F. Lavery, A. Bass, D. G. Strimaitis, A. Venkatram, B. R. Green, P. J. Drivas, and B. A. Egan Apr. 1982 331 p refs
(Contract EPA-68-02-3421)
(PB82-231713; EPA-600/3-82-036) Avail: NTIS HC A15/MF A01 CSCL 13B

The Complex Terrain Model Development program, a multi-year integrated program to develop and validate practical plume dispersion models of known reliability and accuracy for simulating one-hour average ground-level concentrations downwind of elevated sources during stable atmospheric conditions in complex terrain is discussed. The field program consisted of ten flow visualization experiments and eighteen multi-hour tracer gas experiments conducted during stable flow conditions. An overview of the Cinder Cone Butte field program and the results of the modeling analyses completed through June 1, 1981 are given. GRA

N83-13655# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
MAPS DEPICTING NONATTAINMENT AREAS PURSUANT TO SECTION 107 OF THE CLEAN AIR ACT, 1982
Johnnie Pearson, Willis Beal, and George Duggan Feb. 1982 242 p
(PB82-232174; EPA-450/1-82-012) Avail: NTIS HC A11/MF A01 CSCL 13B

A detailed mapping of the United States depicting those areas not attaining the National Ambient Air Quality Standards for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide and total suspended particulates is presented. Nonattainment area maps and supporting lists from Federal Register publications for final actions through February 1, 1982 are included. GRA

N83-13656# North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
THE EFFECTS OF CHEMISTRY AND METEOROLOGY ON OZONE CONTROL CALCULATIONS USING SIMPLE TRAJECTORY MODELS AND THE EKMA PROCEDURE
H. E. Jeffries, K. G. Sexton, and C. N. Saimi Nov. 1981 394 p refs
(Contract EPA-68-02-3523; Grant EPA-R-807762-01)
(PB82-234170; EPA-450/4-81-034) Avail: NTIS HC A17/MF A01 CSCL 13B

Three chemical kinetics mechanisms (Carbon Bond II, lumped species mechanism used in Demerjian and Schere's photochemical box model and the Cal Tech mechanism developed by McRae) were used in a modified version of the OZIPP model to replicate smog chamber data in which automotive exhaust was irradiated (Bureau of Mines data). Two of the mechanisms (CBII and Demerjian) agreed with the data, as well as the existing mechanism in OZIPP (Dodge propylene/butane). The OZIPP model was next used to simulate several days of observations made during the St. Louis RAPS. In several cases, it was found that the meteorological input and/or assumptions did not allow an adequate basis to compare the mechanisms. Three days in which the meteorological input appeared appropriate were simulated using OZIPP with the Dodge, Demerjian and CBII mechanisms. GRA

N83-13657# Rockwell International Corp., Newbury Park, Calif.
QUALITY ASSURANCE IN SUPPORT OF ENERGY RELATED MONITORING ACTIVITIES Annual Report
Miriam Lev-On and Mark Cher Apr. 1982 56 p refs
(Contract EPA-68-02-2412)
(PB82-234238; EPA-600/4-82-036; AR-3) Avail: NTIS HC A04/MF A01 CSCL 13B

The activities during the third year of the program entitled, Quality Assurance in Support of Energy Related Activities are discussed. Discussed are the regularly scheduled quality control reference sample audits conducted for the analysis of sulfate, nitrate, sulfur dioxide, nitrogen dioxide and carbon monoxide, and for weight measurement and high-volume flow rate. Performance results for the third year of the program remained essentially constant for sulfate, nitrate, sulfur dioxide and carbon monoxide. The results for carbon monoxide are noteworthy for their consistently high quality. Results for nitrogen dioxide show some improvement. GRA

N83-13658# Systems Applications, Inc., San Rafael, Calif.
EVALUATION OF SHORT-TERM NO2 PLUME MODELS FOR POINT SOURCES. VOLUME 1. TECHNICAL DISCUSSION Final

Report, Aug. 1977 - Jul. 1979
M. A. Yocke, D. A. Stewart, J. Johnson, and R. J. Frost Dec. 1981 194 p refs
(Contract EPA-68-02-2775)
(PB82-234329; EPA-600/4-81-079) Avail: NTIS HC A09/MF A01 CSCL 13B

Models for predicting short erm NO2 concentrations are discussed, and several (RPM-II, TCM, OLM, and CNOM) are selected for evaluation. The MISTT data, collected in 1976, were to be used to evaluate the models, but careful scrutiny of the data base revealed certain deficiencies relative to the data needs of the models. These deficiencies preclude a strict evaluation of the performance of the models, but simple fitting techniques were used to compensate for input data deficiencies. The models are shown to perform reasonably well using simple statistical measures of performance. The performance of the models is also evaluated using a 'restricted' data base (i.e., one that could be derived from NSW, local, or state agency data sources only), and model performance is shown to be poorer with the unrestricted data base. Author (GRA)

N83-13659# Southern Research Inst., Birmingham, Ala.
SAMPLING FOR HIGH-MOLECULAR-WEIGHT ORGANIC COMPOUNDS IN POWER PLANT STACK GASES Final Report
Walter R. Dickson, Herbert C. Miller, and William J. Barrett May 1982 50 p
(Contract EPA-68-02-2272)
(PB82-234618; SORI-EAS-80-387; EPA-600/7-82-039) Avail: NTIS HC A03/MF A01 CSCL 13B

The results of laboratory and field investigations of experimental sampling systems intended to collect high molecular-weight organic compounds from flue gases in coal-fired power plants are presented. The most promising sampling device was a solid sorbent cartridge inserted directly into the flue gas stream and cooled to a temperature just above the dew point by a forced flow of external ambient air. Although certain sorbent materials were shown to be partially effective for the collection of vapors of polynuclear aromatic hydrocarbons at temperatures of 50 to 60 C, no completely satisfactory sorbert was found. Ambersorb XE340, a nonpolar carbonaceous sorbent, was the most satisfactory of several organic and inorganic sorbent materials tried, but its usefulness was limited by the presence of contaminants that could not be removed.
Author (GRA)

N83-13660# West Virginia Univ., Morgantown. Water Research Inst.
DEVELOPMENT AND EVALUATION OF ION-EXCHANGE RESINS FOR REMOVAL OF SPECIFIC METALS IN WATER TREATMENT
Anthony Winston, Charles R. Jenkins, Weerasak Lerdthusnee, and Susan J. Masten 1981 31 p refs
(Contract DI-14-34-0001-1152)
(PB82-224593; WRI-WVU-81-03; Information-17; W82-05282; OWRT-A-043-WVA(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

An ion-exchange resin specific for iron was developed and evaluated for its performance in removing iron from water supplies. The resin was synthesized by converting the carboxyl groups of Chelex 100 (BioRad) to hydroxamic acids by reaction with ethyl-chloroformate followed by hydroxylamine. The resin was evaluated in bench scale equipment consisting of a column 5 cm in diameter by 1.0 m containing from 0.5 to 1 pound of resin. Iron (III) perchlorate solutions were passed through the column and the iron concentration of the effluent was monitored by atomic absorption spectroscopy. Increasing flow rate and increasing iron concentration caused decreases in the operating exchange capacity of the resin. The exchange capacity varied between 2.9 and 5.8 eq iron per cubic foot of resin depending upon the flow rate and influent iron concentration. The resin can be regenerated by reduction of the iron (III) to iron (II) using sodium hydrosulfite followed by washing. Author (GRA)

N83-13661# Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
FILTRATION PERFORMANCE IN WATER AND WASTEWATER TREATMENT: THEORY AND MEASUREMENT
John E. Tobiason (Wright-Pierce Architects/Engineers) and Charles R. OMelia Raleigh, N.C. N.C. Water Resources Research Inst. Mar. 1982 126 p refs
(Contract DI-14-34-0001-9035; OWRT Proj. A-104-NC)
(PB82-224627; UNC-WRRI-82-172; W82-05285; OWRT-A-104-NC(2)) Avail: NTIS HC A07/MF A01 CSCL 13B

An earlier model for filter ripening, designed to predict changes in effluent quality and head loss with time as filtration proceeds, was extended and applied. Reasonable agreement was found between observed and predicted filtrate quality. Head loss predictions are quantitatively similar to observations but are generally lower. Suspensions containing small particles produce more head loss than suspensions of larger particles when the comparison is based on equivalent masses of solids removed by the filters. Particles smaller than a few microns in size are particularly troublesome in this regard. This indicates that flocculation prior to filtration is important when direct filtration is considered. GRA

N83-13662# University of Central Washington, Ellensburg. Dept. of Chemistry.
ACID PRECIPITATION IN THE WASHINGTON CASCADES, PHASE 1 Progress Report, 1 Oct. 1980 - 30 Sep. 1981
L. Clint Duncan Sep. 1981 25 p refs
(Contract DI-14-34-0001-1151; OWRT Proj. A-110-WASH)
(PB82-224643; W82-05287; OWRT-A-110-WASH(1)) Avail: NTIS HC A02/MF A01 CSCL 13B

Precipitation falling on the Washington Cascades east and windward of the urban Puget Sound area is acidic with a volume average pH of 4.71 at the Cascade Crest (Snoqualmie Pass). Five sampling sites were maintained across the Cascades from January 1981 through July 1981. Twenty-nine watershed source lakes lying along the Cascade Crest 3-20 miles north of the precipitation collectors were sampled in the summer of 1981. Results of acidity tests are given. Author (GRA)

N83-13663# Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
REDUCED RUNOFF AND NONPOINT SOURCE POLLUTION THROUGH INCREASED INFILTRATION
A. R. Jarrett and J. R. Hoover (Northeast Watershed Research Center) Nov. 1981 127 p refs
(Contract DI-14-34-0001-1140; OWRT Proj. A-055-PA)
(PB82-224759; W82-05300; OWRT-A-055-PA(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

The effects of increased soil infiltration on the reduction of runoff and nonpoint source pollution were assessed. Surface venting of entrapped soil air for increasing infiltration in sand was first investigated. Simulated rainfall was applied to a large 75 cm thick sand sample having 13 different surface variations or venting mechanisms, with soil-air pressure measured at seven piezometer locations and runoff recorded. Air entrapment reduced water infiltration, while the installation of air wells, holes, and vertical mulch columns significantly increased infiltration rates. The kinetic energy of escaped soil air and its effect on the detachment of soil practices in dry and saturated soil conditions was then estimated. Also examined was the combined effects of overland flow, escaped soil air, and its transport by overland flow.
Author (GRA)

N83-13664# Radian Corp., Austin, Tex.
IMPACT OF NOx SELECTIVE CATALYTIC REDUCTION PROCESSES ON FLUE GAS CLEANING SYSTEMS Final Report, Oct. 1980 - Oct. 1981
G. D. Jones, R. L. Glover, G. P. Behrens, and T. E. Shirley Apr. 1982 103 p refs
(Contract EPA-68-02-3171)
(PB82-240086; RAD-81-202-187-70-15; EPA-600/7-82-025B) Avail: NTIS HC A06/MF A01 CSCL 13B

The report gives results of a study of the impact of the ammonia leaving a nitrogen oxide (NOx) selective catalytic reduction (SCR)

process on downstream flue gas cleaning processes. (NOx emissions from electric utility boilers may be reduced 80-90% by the application of pollution control technology based on the SCR of NOx with ammonia; however, some unreacted ammonia may be emitted from the control system.) These processes include electrostatic precipitators (ESPs), baghouses, and flue gas desulfurization (FGD) systems. In normal operation, most ammonia leaving the SCR system will be removed, either as particulate salts by the particulate removal system or as free ammonia by the FGD system. Very little ammonia should be emitted at the stack. Author (GRA)

N83-13665# Acurex Corp., Mountain View, Calif.
ENVIRONMENTAL ASSESSMENT OF STATIONARY SOURCE NOx CONTROL TECHNOLOGIES Final Report, Jun. 1976 - Sep. 1979
L. R. Waterland, K. J. Lim, E. B. Higginbotham, R. M. Evans, and H. B. Mason May 1982 339 p refs
(Contract EPA-68-02-2160)
(PB82-249350; EPA-600/7-82-034; Rept-80-57/EE) Avail: NTIS HC A15/MF A01 CSCL 13B

Results of a 3-year evaluation of combustion modification controls for emissions of NOx and other pollutants from stationary combustion sources are given. Results include field tests of gaseous, liquid, and solid effluents from seven stationary sources; estimates of environmental effects of using combustion modification control; evaluation of NOx control reduction effectiveness, capital and operating costs, and operational impact for several levels of control; projection of control technology needs to the year 2000 for several scenarios of energy growth and environmental regulations; and inventories of nationwide stationary source emissions for major pollutants and emission projections to the year 2000. Three utility boilers, two industrial boilers, a gas turbine, and a low-emission residential heating system were tested. GRA

N83-13666# Ebon Research Systems, Washington, D.C.
EMERGING TECHNOLOGIES FOR THE CONTROL OF HAZARDOUS WASTES Final Report
Barbara H. Edwards, John N. Paullin, and Kathleen Coghlan-Jordan Mar. 1982 158 p refs
(Contract EPA-68-03-2787)
(PB82-236993; EPA-600/2-82-011) Avail: NTIS HC A08/MF A01 CSCL 13B

Technologies for the disposal of hazardous wastes were investigated. The need for a data base for emerging hazardous waste technologies was evaluated. Information on the emerging technologies was acquired by computerized search, library searching, and personal contacts. Technologies discussed include: molten salt combustion, fluidized bed incineration, high energy electron treatment of trace organic compounds in aqueous solution, the catalyzed wet oxidation of toxic chemicals, dehalogenation of compounds by treatment with ultraviolet (UV) light and hydrogen, UV/chlorinolysis of organics in aqueous solution, the catalytic hydrogenation-dechlorination of polychlorinated biphenyls (PCB's), and ultraviolet/ozone destruction. Theory, specific wastes treated, and economics are discussed. GRA

N83-13667# SRI International Corp., Menlo Park, Calif.
ENAMAP-1A LONG TERM SO2 AND SULFATE AIR POLLUTION MODEL: REFINEMENT OF TRANSFORMATION AND DEPOSITION MECHANISMS Final Report, 17 Jul. 1980 - 31 Jul. 1981
P. M. Mayerhofer, R. M. Endlich, B. E. Cantrell, R. Brodzinsky, and C. M. Bhumralkar Jul. 1981 96 p refs
(Contract EPA-68-02-3424)
(PB82-237017; EPA-600/3-82-063) Avail: NTIS HC A05/MF A01 CSCL 13B

The Eastern North American Model of Air Pollution (ENAMAP-1) model for long-range air pollution transport was modified in several ways to produce a newer version, ENAMAP-1A. The geographic region of the modeled domain was increased to include southeastern Canada, and the meteorological and emission data for this area was added to the U.S. data base. The transformation rate for SO2 to SO4(-2) and the deposition rates of SO2 and SO4(-2) were updated. In ENAMAP-1 these rates are all constants; in ENAMAP-1A they are variable in space and time. The transformation rate was made dependent on the amount of sunshine (i.e. a function of latitude and season) and is about twice as large as the previous rate. In ENAMAP-1A the dry deposition rate was made dependent on the type of underlying terrain and vegetation, on thermal stability in the boundary layer, and on time of day. Author (GRA)

N83-13668# Hydrocomp, Inc., Mountain View, Calif.
MAINTENANCE AND TESTING OF HYDROLOGICAL SIMULATION PROGRAM-FORTRAN (HSPF) Final Report, Mar. 1979 - Jun. 1980
Robert C. Johanson and David Kliewer May 1982 85 p refs
(Contract EPA-68-01-5801)
(PB82-237033; EPA-600/3-82-059) Avail: NTIS HC A05/MF A01 CSCL 13B

The Hydrological Simulation Program-FORTRAN (HSPF) is a mathematical model that simulates hydrology and water quality in natural and man-made water systems. This report describes the work involved in maintaining and testing HSPF over a one-year period following its initial development. An account is given of the chronology of major events during the maintenance work. The testing included work with hypothetical data and checks against outputs produced by three predecessor models. Through this process it was determined that the HSPF model functioned as designed. GRA

N83-13669# Miami Univ., Coral Gables, Fla. Dept. of Mechanical Engineering.
PROCEEDINGS OF THE 3RD CONFERENCE ON WASTE HEAT MANAGEMENT AND UTILIZATION
May 1982 953 p refs Conf. held at Miami Beach, Fla., 11-13 May 1981 Sponsored by EPA
(PB82-227901; EPA-600/9-82-008) Avail: NTIS HC A99/MF A01 CSCL 13B

The conference addressed programs in waste heat management and utilization, utilization of waste heat from industrial processes, thermal discharges and related phenomena, cooling towers and their effects, greenhouse applications of waste heat, environmental effects of waste heat discharges to water bodies, and management and regulatory aspects of waste heat. GRA

N83-13670# Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
TECHNOLOGY ASSESSMENT OF ANAEROBIC SYSTEMS FOR MUNICIPAL WASTEWATER TREATMENT: PART 1. ANAEROBIC FLUIDIZED BED. PART 2. ANFLOW Final Report, Aug. 1980 - Aug. 1981
James A. Heidman Feb. 1982 59 p refs
(PB82-229170; EPA-600/2-82-004) Avail: NTIS HC A04/MF A01 CSCL 13B

Two developing technologies for the treatment of municipal wastewaters are described. These technologies are anaerobic fluidized bed systems and an anaerobic fixed-film bioreactor (ANFLOW). The topics discussed include: available laboratory data on system performance, fluidized bed expansion and voidage-velocity relationships; the influence of bacterial growth on changes in fluidization characteristics; power requirements for fluidization; potential cost and energy savings compared to activated sludge secondary treatment plants; and estimates of anaerobic fluidized bed treatment costs. GRA

N83-13671# Martin Marietta Labs., Baltimore, Md. Environmental Center.
STACK PLUME INTERACTION AND FLOW CHARACTERISTICS FOR A NOTCHED RIDGE Final Report
J. C. Weil, S. C. Traugott, and D. K. Wong Mar. 1982 90 p refs
(Contract P59-80-04)
(PB82-229683; PPRP-61) Avail: NTIS HC A05/MF A01 CSCL 13B

Results of a theoretical and experimental investigation of plume transport and dispersion interaction with elevated, complex terrain

are presented. The terrain consists of a ridge of uniform height notched by one or more gaps, which is typical of Eastern Appalachian features of interest in power plant siting. Various combinations of stack locations, gap arrangements, incident wind direction, and atmospheric stability were studied. Numerical predictions, environmental wind tunnel experiments, and salinity-stratified water tank towing tests were performed. Predictions were restricted to either neutral or strongly stable ambient flow. Fair to good agreement was obtained between prediction and experiments for a buoyant plume in neutral conditions, and for ambient flow in strongly stable conditions. Both theoretical and experimental results are also reported for more general conditions beyond those for which a direct validation was feasible. GRA

N83-13672# Weston (Roy F.), Inc., West Chester, Pa.
TECHNOLOGY ASSESSMENT OF SOLAR THERMAL ENERGY APPLICATIONS IN WASTEWATER TREATMENT Final Report, May 1980 - Aug. 1981
Feb. 1982 112 p refs
(Contract EPA-68-03-2775)
(PB82-229790; EPA-600/2-82-006) Avail: NTIS HC A06/MF A01 CSCL 13B

Three major areas were identified for which solar thermal energy usage has potential applicability in publicly owned treatment works. These areas include space and domestic water heating, anaerobic digester heating, and sludge drying. A detailed analysis of solar heating of anaerobic digesters utilizing an active solar energy (flat-plate collector) system is given. A present worth cost-effectiveness analysis was performed whereby the present worth of the anaerobic digester gas conserved was compared to the present worth of the solar energy collection system. Based on the analysis, solar-aided anaerobic digester heating proved uneconomical at all locations within the United States. A sensitivity analysis was performed to determine which variable had the greatest effect on the cost analysis. Variables considered included collector system price per unit area, annual operations and maintenance cost, fuel escalation cost factor, and percent solids in digester feed. The analysis indicated that the collector system cost was the most sensitive item. GRA

N83-13673# Acurex Corp., Morrisville, N.C.
PILOT-SCALE ASSESSEMENT OF CONVENTIONAL PARTICULATE CONTROL TECHNOLOGY FOR PRESSURIZED FLUIDIZED-BED COMBUSTION EMISSIONS Final Report, Mar. 1979 - Jun. 1980
W. O. Lipscomb, III, S. R. Malanni, C. L. Stanley, and S. P. Schliesser Apr. 1982 132 p refs
(Contract EPA-68-02-2646)
(PB82-230921; EPA-600/7-82-028) Avail: NTIS HC A07/MF A01 CSCL 13B

Results of an evaluation of electrostatic precipitator (ESP) and fabric filter particulate control technology for the EPA/Exxon pressurized fluidized bed combustion (PFBC) Miniplant in Linden, NJ are given. EPA's mobile ESP and fabric filter pilot facilities were slip streamed downstream of the Miniplant's tertiary cyclone to simulate the flue gas stream exiting a PFBC combined cycle gas turbine. Results presented include control device operating characteristics and performance based on mass and fractional collection efficiencies. Author (GRA)

N83-13674# SMC-Martin, Inc., King of Prussia, Pa.
ENVIRONMENTAL IMPACTS OF SPECIAL TYPES OF LANDFILLS Final Report
Deborah Grant Lord and William W. Beck, Jr. Sep. 1981 284 p refs
(Contract EPA-68-03-2620)
(PB82-231432; EPA-600/2-81-190) Avail: NTIS HC A13/MF A01 CSCL 13B

Water quality was monitored for one year at a hillfill, a balefill, a millfill, a strip mine landfill, and a permitted sanitary landfill to determine the impact of each on water quality. The leachate generated by the hillfill was the strongest during initial decomposition. However, during the study period, it was in the final stages of anaerobic degradation and therefore was of low strength. The balefill produced a low strength leachate since this method of landfilling results in channeling of water through the landfill. The millfill generated the strongest leachate among the leachates analyzed during the study period as a result of the decomposition of the refuse which was accelerated by milling. The strip mine landfill generated a leachate of moderater strength. The permitted sanitary landfill also produced a leachate of moderate strength. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-13675 Ohio State Univ., Columbus.
NUMERICAL CALCULATION OF STEADY-STATE TURBULENT ATMOSPHERIC FLOWS OVER A VALLEY UNDER NEUTRAL AND UNSTABLE THERMAL STRATIFICATIONS Ph.D. Thesis
John Douglas Carlson 1982 343 p
Avail: Univ. Microfilms Order No. DA8222058

A two-dimensional numerical model is developed to investigate steady-state, three-dimensional turbulent atmospheric flow over a valley under neutral and unstable thermal stratifications. The latter situtation is representative of mid-afternoon conditions on a sunny day. The valley dimensions are invariant along the valley axis. The numerical model features an explicity modeled surface layer, an overlying region in which the finite-difference analog of the vorticity, streamfúnction, axial velocity component, and potential temperature equations are solved over a uniform grid, and an upper boundary above which two-dimensional Ekman flow is assumed. Closure is accomplished via locally isotropic eddy viscosities and diffusivities modeled as the product of a mixing length squared and a wind shear parameter. Finite-difference solutions are obtained by integrating the unsteady governing equations over time until steady-state conditions are reached. This integration is carried out by an alternating-direction implicit numerical algorithm with iteration of boundary conditions at each time step. Second-order accurate results are achieved and an error analysis presented. The numerical results corroborate the observed phenomena of channeling of flow by a valley and thermally produced slope winds. Dissert. Abstr.

N83-13676 Arizona Univ., Tucson.
NUMERICAL STUDIES OF BAROCLINIC INSTABILITY IN CYLINDRICAL AND SPHERICAL DOMAINS Ph.D. Thesis
Timothy Lee Miller 1982 177 p
Avail: Univ. Microfilms Order No. DA8223011

Finite difference numerical models based upon the Navier-Stokes equations with the Boussinesq approximation have been utilized to study the dynamics of a rotating liquid with horizontal density gradients. There are two configurations and analyzed: a cylindrical annulus of water rotating about a vertical axis (parallel to the body force), and a hemispherical shell of silicone oil with a radial body force, rotating about the polar axis. In both the cylindrical and spherical configurations, the thermal and mechanical forcings (boundary conditions) are symmetric about the axis of rotation. The physical parameters varied are the rotation rate and the amplitude of the horizontal thermal forcing. Two numerical models have been developed for each geometrical configuration: one to calculate axisymmetric flows and another to test the stability of those flows to non-axisymmetric perturbations. The primary purpose of the models is to determine whether axisymmetric or non-axisymmetric flow will be observed in a corresponding laboratory experiment. For the cylindrical annulus, the predictions of axisymmetric and non-axisymmetric flow are in good agreement with laboratory experiments previously performed. Dissert. Abstr.

N83-13677 Utah Univ., Salt Lake City.
DETERMINATION OF CORRECTIONS REQUIRED TO INCLUDE SCATTERING IN THE EVALUATION OF J VALUES Ph.D. Thesis
Keith Vernon Montierth, Jr. 1982 166 p
Avail: Univ. Microfilms Order No. DA8224159

The effects of first order scattering on the rates of dissociation of minor constituents has been studied by collecting ultraviolet scatter radiance data in the 2000A-3200A wavelength region from 0 to 40 km. These data were collected by flying a scanning spectrometer on a balloon platform. Using these data and a radiation transport model constructed for this purpose the first order scattering conribution to the minor constituent rates of dissociation has been constructed for this altitude range and a variety of solar zenith angles. The contribution of the first order scattering to the minor constituent rates of dissociation is expressed in terms of a ratio r which is used to calculate the minor constituent dissociation rate. Any irradiance terms, reflection off the Earth surface and multiple scattering from the atmosphere, are added and the result multiplied by the cross section. The result is the dissociation rate per molecule due to solar radiation at that wavelength. Dissert. Abstr.

N83-13678 Utah State Univ., Logan.
A STUDY OF ATMOSPHERIC ENERGETICS IN AN OPEN MESOSCALE SYSTEM AND THE IMPLICATIONS OF ANTHROPOGENIC HEAT AND MOISTURE ON ATMOSPHERIC CIRCULATIONS Ph.D. Thesis
John Keenan Westbrook 1982 145 p
Avail: Univ. Microfilms Order No. DA8224175

Mesoscale circulations and the impact of moist plumes on altering these circulations were studied by the use of atmospheric energetics analysis. The mean values of the available potential energy (APE) and the kinetic energy (KE) and the energy transfer and transformation terms exhibited a dependence upon the scale of study. Converting the APE and KE values to energy per unit pressure depth values revealed that the mesoscale energy values were 3 to 5 times smaller in magnitude than the respective energy values for the mean planetary circulation. The rate of conversion of APE and KE was shown to be a function of the strength of the planetary boundary layer circulation. The long wave radiative flux divergence was the only physical mechanism examined which could modify atmospheric energetics due to the introduction of additional water vapor into the atmosphere. The impact of large water vapor emissions into the atmosphere was not found to significantly modify the mesoscale atmospheric energetics. Dissert. Abstr.

N83-13679 Columbia Univ., New York.
ATMOSPHERIC DISTRIBUTION OF CARBON DIOXIDE AND ITS EXCHANGE WITH THE BIOSPHERE AND THE OCEANS Ph.D. Thesis
Antonio Expedito Gomes deAzevedo 1982 185 p
Avail: Univ. Microfilms Order No. DA8222340

The global carbon cycle is analyzed from the point of view of the distribution and exchange between the reservoirs of atmosphere, biosphere, and oceans. The partition of excess CO2 between the atmosphere and the oceans is examined with a box-diffusion model. The calibration of the ocean model is made by inspecting the predicted distribution of natural carbon-14 and bomb carbon-14 and Tritum. The atmospheric distribution is investigated using a box model for latitudinal belts of 10 degrees. The mixing inside the atmosphere is parameterized by a constant meridional eddy diffusivity with a restriction in the exchange across the ITCZ. The exchange with the oceans is taken as proportional to the difference in partial pressure of CO2 in the atmosphere and in the surface of the ocean. The exchange with the biosphere divided in two components. The seasonal variations in the balance between the uptake and release of carbon and local secular variation in the biomass are included. Dissert. Abstr.

N83-13680 Institut d'Aeronomie Spatiale de Belgique, Brussels.
TWILIGHT OBSERVATIONS FROM BALLOON ALTITUDE. PART 1: BLUE SUNLIGHT EXTINCTION AND SCATTERING BY DUST IN THE 60 KM ALTITUDE ATMOSPHERIC REGION
M. Ackerman, C. Lippens, C. Muller, and P. Vrignault 1982 35 p refs
(Aeronomica-Acta-A-246-1982-1) Avail: Issuing Activity

Photographic balloon data obtained in the falls of 1980 and of 1981 and in the spring of 1982 are presented for blue and red light. They indicate the presence of a dust light-absorbing and scattering layer in the mesosphere at altitudes near 60 km with a low scattering albedo (0.1) at 0.44 microns. The optical efficiency of the layer increases more than 10 times when the wavelength of the interacting light changes from 0.65 to 0.44 microns. At the zenith and near sunset, the natural 0.44 micron extinction optical thickness and the sq cm column scattering rate due to this layer are respectively found to be 0.066 and 0.18 mega Rayleigh per A on May 3, 1982 above the southwest of France. Author (ESA)

N83-13681*# Maryland Univ., College Park. Inst. for Physical Science and Technology.
GENERATION OF THE AURORAL KILOMETRIC RADIATION
C. S. Wu, H. K. Wong, D. J. Gorney (Aerospace Corp., El Segundo), and L. C. Lee (Alaska Univ., Fairbanks) 1 Jun. 1982 53 p refs (Grant NGL-21-002-005; Contract F04701-80-C-0081; Grants NSF ATM-80-00518; NSF ATM-79-16470)
(NASA-CR-169532; NAS 1.26:169532; ATR-82(7883)-1) Avail: NTIS HC A04/MF A01 CSCL 04A
For abstract, see A82-35542.

N83-13682# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RADIOMETRIC CORRECTION OF SATELLITE IMAGES [CORRECAO RADIOMETRICA DE IMAGENS DE SATELITE]
Luiz Alberto Vieira Dias May 1982 7 p refs In PORTUGUESE Presented at the INPE-LCC Seminar, Rio de Janeiro, 25-27 Nov. 1981
(INPE-2406-PRE/116) Avail: NTIS HC A02/MF A01

Methods for atmospheric correction for satellite images are compared. The Turner atmospheric model, signature expansion, correction for atmospheric effects using ocean images, and the Kanazawa photon detection method are compared with a method developed at INPE, which involves pattern recognition based on atmospheric physics. The advantages, disadvantages, and limitations of each method are discussed. J.D.

N83-13683*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POSTSEISMIC DEFORMATION DUE TO SUBCRUSTAL VISCOELASTIC RELAXATION FOLLOWING DIP-SLIP EARTHQUAKES
Steven C. Cohen Sep. 1982 17 p refs Submitted for publication
(NASA-TM-84005; NAS 1.15:84005) Avail: NTIS HC A02/MF A01 CSCL 08K

The deformation of the Earth following a dip-slip earthquake is calculated using a three layer rheological model and finite element techniques. The three layers are an elastic upper lithosphere, a standard linear solid lower lithosphere, and a Maxwell viscoelastic asthenosphere-a model previously analyzed in the strike-clip case (Cohen, 1981, 1982). Attention is focused on the magnitude of the postseismic subsidence and the width of the subsidence zone that can develop due to the viscoelastic response to coseismic reverse slip. Detailed analysis for a fault extending from the surface to 15 km with a 45 deg dip reveals that postseismic subsidence is sensitive to the depth to the asthenosphere but is only weakly dependent on lower lithosphere depth. The greatest subsidence occurs when the elastic lithosphere is about 30 km thick and the asthenosphere lies just below this layer (asthenosphere depth = 2 times the fault depth). The extremum in the subsidence pattern occurs at about 5 km from the surface trace of the fault and lies over the slip plane. In a typical case after a time t = 30 tau (tau = Maxwell time) following the earthquake the subsidence at this point is 60% of the coseismic uplift. Unlike the horizontal deformation following a strike slip earthquake, significant vertical deformation due to asthenosphere

flow persists for many times tau and the magnitude of the vertical deformation is not necessarily enhanced by having a partially relaxing lower lithosphere. B.W.

N83-13684*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
SEISMICITY AND ACTIVE TECTONICS OF THE ANDES AND THE ORIGIN OF THE ALTIPLANO Final Technical Report, 1 Mar. 1980 - 31 Oct. 1982
Peter Molnar 31 Oct. 1982 90 p refs
(Grant NAG5-19)
(NASA-CR-169539; NAS 1.26:169539) Avail: NTIS HC A05/MF A01 CSCL 08K

Large earthquakes and active deformation on the Andes were studied. Earthquakes on the east side of the Andes were generally found to reflect east-west crustal shortening. These earthquakes seem to occur throughout the crust and do not reflect a detachment and low angle thrusting of the sedimentary cover onto the Brazilian shield. Instead they imply deformation of the basement. The rate of shortening is compatible with construction of the Andes by crustal shortening since the late Cretaceous, and the surface geology, at least qualitatively, is considered to reflect this process. Andean margins are considered to be a result of crustal shortening. The crustal shortening in the sub-Andes occurs concurrently with normal faulting at high elevations in parts of the Andes. The normal faulting is associated with the buoyancy of the thick crust. Crustal shortening thickens the crust and work is done against gravity. When the crustal thickness and elevation reach limiting values, the range grows laterally by further thrusting on the margins. Author

N83-13685# Naval Research Lab., Washington, D. C. Space Science Div.
THE LASSII PROGRAM: OBJECTIVES, SPACECRAFT DESIGN AND MISSION SCENARIOS FOR FULL-SCALE, SHUTTLE-LAUNCHED, FREE-FLYER OPERATIONS Interim Report
Edward P. Szuszczewicz and Robert E. Palma 16 Jun. 1982 128 p refs
(RR0330244)
(AD-A119078; NRL-8420) Avail: NTIS HC A07/MF A01 CSCL 20/9

The LASSII concept is simple, but fundamentally different from that of any past or present satellite mission: to employ a sortie-mode free-flying satellite which is launched and recovered by Shuttle, and instrumented with a complement of plasma diagnostic tools which have been specifically designed to spatially and temporally resolve all active elements within an ionospheric irregularity and determine associated effects on relevant military channels. The satellite, configured for maximum flexibility as an investigative platform, will co-orbit in tandem or in overflight with a Shuttle-borne plasma diagnostics complement, making possible separation of space and time dependencies and allowing important determinations of growth and transport mechanisms in turbulent ionospheric plasmas. The satellite will be able to execute Hohmann and Crocco maneuvers with complete flexibility for selection of time spacing between Shuttle-borne and LASSII free-flyer measurements of a given ionospheric volume while satellite-to-ground and satellite-to-satellite systems tests are executed. The uniqueness of the LASS II concept makes it compatible with all Shuttle orbits from 200 to 1000 km and for all inclinations. The nature of the program, with emphasis on naturally occurring as well as artificially produced ionospheric irregularities, is also easily accommodated by Shuttle regardless of season or solar conditions. Program planning will focus on short-duration (7 to 30 days) experiments which will take advantage of built-in flexibility in the LASSII payload complement. The experiment duration will help develop efficiency through a concentrated approach to research problems designed to provide near-term solutions to issues of immediate concern. GRA

N83-13686# Colorado Univ., Denver. Center for Environmental Sciences.
GEOCHEMICAL BASELINE STUDIES IN THE UINTA BASIN, UTAH. OIL SHALE ENVIRONMENTAL RESEARCH AND COORDINATION Progress Report, 1979 - 1982
W. R. Chappell 1982 363 p refs
(Contract DE-AC02-79EV-10298)
(DE82-020755; DOE/EV-10298/3) Avail: NTIS HC A16/MF A01

Trace element composition for stream sediments from the eastern Uinta Basin, Utah, which will provide data analogous to that developed by Ringrose for the Piceance Basin was evaluated. These stream sediments are predevelopment baseline samples from the portion of the Uinta Basin east of the Green River. The area includes the Prototype Lease Tracts U-a and U-b, as well as the various corporate owned and leased sites proposed for development in Utah. Geochemical baselines are conducted for surface soils and plants from the eastern Uinta Basin. Plant materials are analyzed from the intensive study site. Specimen are analyzed for: molybdenum, copper, zinc, fluorine, boron, mercury and organic carbon. DOE

N83-13687# Sandia Labs., Albuquerque, N. Mex.
DETERMINING LOCAL GEOLOGICAL STRUCTURE IN TENNESSEE BY USING SPECTRAL RATIOS
H. D. Garbin Apr. 1982 20 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014348; SAND-82-0227) Avail: NTIS HC A02/MF A01

Seismic data obtained from a single station were used to infer local structure beneath the station. Both short period and long period P waves were analyzed by using spectral ratios to find the sedimentary and crustal layering, respectively. The crustal model resulted in a 17 km thick upper layer for an assumed 6.1 km/s velocity. The sedimentary model derived from the short period records fits the actual data reasonably up to 6 Hz. The top most sedimentary layer is 0.5 km thick, when 3.24 km/s P wave and 1.72 km/s S wave velocities are assumed. DOE

N83-13688# Los Alamos Scientific Lab., N. Mex.
AGE AND LOCATION OF VOLCANIC CENTERS LESS THAN OR EQUAL TO 3.0 M.Y. OLD IN ARIZONA, NEW MEXICO AND THE TRANS-PECO AREA OF WEST TEXAS
M. J. Aldrich and A. W. Laughlin Dec. 1981 28 p refs
(Contract W-7405-eng-36)
(DE82-015901; LA-8812-MAP-Rev) Avail: NTIS HC A03/MF A01

Maps designed for hot dry rock geothermal assessment in Arizona, New Mexico, and the trans-Peco area of the west Texas are presented. The 3.0 m.y. cutoff age was selected since it is assumed that largely dissipated in older rocks. The distribution of all volcanic rocks less than or equal to 3.0 m.y. old, for which there is at least one determined age, are shown. Location of the volcanic vents and rocks were taken from Luedke and Smith and ages were obtained from the original literature. DOE

N83-13689# Sandia Labs., Albuquerque, N. Mex.
GEOTECHNICAL FIELD MEASUREMENTS: G-TUNNEL, NEVADA TEST SITE
R. M. Zimmerman and W. C. Vollendorf May 1982 29 p refs
(Contract DE-AC04-76DP-00789)
(DE82-019963; SAND-81-1971) Avail: NTIS HC A03/MF A01

The FY81 geotechnical measurements focused on borehole measurements in the Grouse Canyon welded tuff in G-tunnel on the Nevada Test Site. These ambient temperature measures were taken to: (1) establish baseline reference field data, and (2) gain field testing experience in welded tuff. The in situ state of stress was obtained using the three-hole overcoring method with the US Bureau of Mines three-component borehole deformation gage. The orthogonal horizontal stresses were 5.5 and 0.3 MPa and the nominal vertical was 8.5. Biaxial tests were performed on recovered cores and the average modulus of deformation was 31 GPa. The modulus of deformation using the borehole jack (Goodman) had an average value of 12 GPa. This value is not corrected for effective bearing contact area. Two orthogonal boreholes were used to determine the range of hydraulic conductivities. The range was from 0.022 cm/s (22 Darcy's) to 1.923 cm/s (1988 Dracy's). DOE

N83-13690# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DIRECT NORMAL SOLAR RADIATION DATA MANUAL: LONG-TERM, MONTHLY MEAN, DAILY TOTALS FOR 235 NATIONAL WEATHER SERVICE STATIONS. ADDENDUM TO THE INSOLATION DATA MANUAL
Connie L. Knapp and Thomas L. Stoffel Jul. 1982 87 p refs
(Contract DE-AC02-77CH-00178)
(DE82-020377; SERI/SP-281-1658) Avail: NTIS HC A05/MF A01

Average monthly data are presented that depict the long-term geographic distribution of direct normal solar radiation in the US. Some terms are defined, the model for estimating hourly direct normal insolation is described, and its validation is discussed. Direct normal radiation is then tabulated for 235 National Weather Service Stations, given as monthly and annual averages in units of kJ/m(2)-day, Btu/ft(2)-day, and kWh/m(2)-day. Direct normal solar radiation contour maps are then given for each month, and station histories are tabulated giving the station location and number, latitude, longitude, elevation, and period recorded. DOE

N83-13691# Sandia Labs., Albuquerque, N. Mex.
BOREHOLE SEISMIC UNIT
R. W. Seavey May 1982 39 p refs
(Contract DE-AC04-76DP-00789)
(DE82-019845; SAND-82-0373) Avail: NTIS HC A03/MF A01

Fracture orientation can be measured by using a triaxial geophone package located at the fracture interval within the wellbore. Seismic signals produced by the fracture can be recorded and measured to determine the direction of the fracture. A description of a borehole seismic unit and procedures to accomplish this task are reported. DOE

N83-13692# Los Alamos Scientific Lab., N. Mex.
STUDY OF COUPLING BETWEEN NEUTRAL-AIR MOTION AND THE IONOSPHERE
P. A. Bernhardt Jun. 1982 78 p refs
(Contract W-7405-eng-36)
(DE82-019483; LA-9428-MS) Avail: NTIS HC A05/MF A01

The coupling between an acoustic wave originating at or below the earth's surface and the ionosphere is described by equations of continuity and motion. The plasma concentration is influenced by collisional and electrostatic forces. Above 130 km altitude, ion neutral collisions are rare and the plasma tends to be tied to the magnetic field lines. In this region only the magnetic field aligned components of the acoustic disturbance influences the plasma concentration. Below 120 km altitude, ion neutral collisions dominate over the magnetic field and the plasma responds isotropically to the disturbance. In this lower region, motion of plasma across magnetic field lines produces electric fields and currents. The acoustic wave in the ionosphere may be detected by observations of changes in electron concentration and magnetic field intensity. DOE

N83-13693# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
DETERMINATION OF ABSOLUTE GRAVITY
J. E. Faller, Y. G. Guo (National Inst. of Metrology, Beijing), and M. A. Zumberge 1981 14 p refs Prepared in cooperation with NBS, Boulder Sponsored in part by AFGL and NBS
(DE82-904707; NP-2904707) Avail: NTIS HC A02/MF A01

The status of absolute gravimetry is discussed. An easily portable apparatus for the absolute determination of the acceleration of gravity is described. Laboratory tests of this instrument indicate that a measurement accuracy of six parts in a billion is achieved. This corresponds to an equivalent height sensitivity of about 2 cm. DOE

N83-13694# North Dakota Geological Survey, Grand Forks.
COMPUTER MANAGEMENT OF GEOLOGIC AND PETROLEUM DATA AT THE NORTH DAKOTA GEOLOGICAL SURVEY
Kenneth L. Harris, Laramie M. Winczewski, and Howard R. Umphrey 1982 37 p refs
(DE82-904385; NP-2905271; Rept-74) Avail: NTIS HC A03/MF A01

A map-oriented data management system, GEOSTOR, is described. General and specific design criteria are discussed in addition to the data elements, coordinate systems, and data entry and retrieval. DOE

N83-13695# Research Inst. of National Defence, Stockholm (Sweden).
SEISMOLOGY, 1981, NUCLEAR TEST BAN VERIFICATION. EARTHQUAKE AND EARTH RESOURCE INVESTIGATION Progress Report, 1981
Jul. 1982 91 p refs
(FOA-C-20460-T1) Avail: NTIS HC A05/MF A01

Seismological projects, including nuclear explosion monitoring, the development of international data centers, seismic risk estimation for nuclear power plants, oil exploration using seismic methods, and crystalline rock investigation using seismic cross hole measurements are reported on. In 1981, France conducted 11 nuclear tests, Britain 1, the US 16, and the USSR 21. The explosions were within the 150 kton limit. Author (ESA)

N83-13696# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
SOUNDING ROCKET PROGRAM MAGNETOSPHERE: THE BARIUM ION JET EXPERIMENT ON PAYLOAD PORCUPINE Final Report, Jun. 1981
Erich Rieger, Hermann Foeppl, Gerhard Haerendel, Bernd Haeusler, and Arnoldo Valenzuela Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 29 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-013; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,50

The electric field as a function of altitude was probed using the barium ion jet experiment on the sounding rocket payload PORCUPINE, in the vicinity of and above auroral arcs, where voltages of up to several kV along magnetic field lines are suggested. The orientation of the barium ion jet during the flights of PORCUPINE 2,3 and 4, was studied. A network of ground and airborne observation stations operated during the active phase of the experiments. Ground magnetometer measurements were also made. No parallel magnetic field potential differences were determined during the observation of the three barium jet experiments. A difference in the declination for the Ba jet of PORCUPINE 2 and 4 can be attributed to field-aligned currents on the order of 0.5 to 1.1 A/m. The overhead electric current system was calculated by correlation of the electric fields obtained from the Ba jets and electron density measurements carried out on PORCUPINE. Author (ESA)

N83-13697# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.
AN EXPERIMENTAL STUDY OF TURBULENCE IN AN URBAN ENVIRONMENT
John F. Clarke, Jason K. S. Ching, and James M. Godowitch May 1982 167 p refs
(PB82-226085; EPA-600/3-82-062) Avail: NTIS HC A08/MF A01 CSCL 04A

The structure of turbulence in the urban surface boundary layer is discussed. Wind and temperature fluctuations were measured with fast-response sensors at a height of 31 m at a rural and three urban sites in the St. Louis environs. The second moments of the fluctuations were computed for one-hour time series and analyses within the framework of Monin-Obukhov similarity theory. The results are discussed relative to observed land-use features and calculated surface roughness lengths for each of the sites. Author (GRA)

N83-13698# Bureau of Mines, Pittsburgh, Pa. Research Center.
DETERMINATION OF GEOLOGIC FEATURES ASSOCIATED WITH LINEARS
Jacqueline H. Jansky and Paul W. Jeran May 1982 14 p refs

(PB82-233735; BM-RI-8660; LC-82-600008) Avail: NTIS HC A02/MF A01 CSCL 08I

A study to determine the relationship between geologic features and linears is discussed. Cleats, kettlebottoms, and roof rolls were mapped and superimposed on the linear plots for a coal mine in West Virginia. No clear relationships were evident. This may be due, in part, to the mining practice of leaving head coal, which obscures geologic features that may exist in the roof. Future studies should concentrate on mines where roof is extensively exposed. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-13699 Colorado State Univ., Fort Collins.
THE ROLE OF GENERAL CIRCULATION IN TROPICAL CYCLONE GENESIS Ph.D. Thesis
Geoff Bruce Love 1982 223 p
Avail: Univ. Microfilms Order No. DA8218389

The role that large scale circulation patterns play in tropical cyclone genesis are investigated. The problem of defining the important flow features observed prior to cycloe genesis in the northwest Pacific and Australian region is addressed. A combination of case study and compositing was used to identify those weather systems which interact with a pregenesis tropical cloud cluster, enhancing its development potential. A series of simple numerical model experiments were carried out. The shallow water equations were solved for an arbitrary time dependent forcing in either wind or height field. Spherical geometry and a realistic pole to pole zonal wind profile were used. Dissert. Abstr.

N83-13700 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. THE CLIMATE IN SELECTED AREAS OF THE FEDERAL REPUBLIC OF GERMANY: MUNICH [BERICHTE DES DEUTSCHEN WETTERDIENST. NR. 159: DAS KLIMA AUSGEWAEHLTER ORTE DER BUNDESREPUBLIK DEUTSCHLAND MUENCHEN]
Peter Jochen Schaefer 1982 258 p refs In GERMAN; ENGLISH summary
(ISBN-3-88148-194-X; ISSN-0072-4130; Rept-159) Avail: Issuing Activity

The climate in the Munich area (West Germany) is described. An historical review is presented and the most important climatological elements are briefly described. The most relevant features of 197 tables are discussed, as an aid for engineering, economics and science. The statistical data refer to the period 1951 to 1970 and consist mainly of tables with monthly, daily and sometimes hourly mean values and of frequency distributions. A survey of the statistical connections existing between pairs of climatological elements is provided by the last group of tables. The material is based on climatic observations made at 7 a.m., 2 p.m. and 9 p.m. mean local time, as well as on hourly synoptic observations and on evaluations from recordings. Author (ESA)

N83-13701 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. CLIMATOLOGICAL DESCRIPTION OF THE UPPER RHINE AREA WITH A VIEW TO HEATING PROBLEMS. HEATING PROJECT UPPER RHINE AREA, PART 1 [BERICHTE DES DEUTSCHEN WETTERDIENST. NR. 160: KLIMATOLOGISCHE BESCHREIBUNG DES OBERRHEINGEBIETS IM HINBLICK AUF ABWAERMEPROBLEME ABWAERMEPROJEKT OBERRHEINGEBEIET, TEIL 1]
Helene Bartels, Hartmut Fuchs, Guenter Jurksch, Juergen Melchior, and Gerd Suessenguth 1982 59 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(ISBN-3-88148-198-2; ISSN-0072-4130; Rept-160) Avail: Issuing Activity

Climatological elements of interest to the anthropogeneous input of sensible and latent heat into the atmosphere were investigated. The investigation was based on ground measurements and observations of synoptic and climatological stations in the Upper Rhine area. Mean annual values, mean annual sums or annual frequency distributions of meteorological elements are used to describe the climatological conditions. The outlines of maps and tables are mainly based on the periods 1931 to 1960 and 1951 to 1970. Possibilities of combining climatological elements are examined and represented by developing synthetical maps. Areas which are already sensitive to additional heat sources due to the present climatological state, can be determined approximately. Author (ESA)

N83-13702*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC DOPPLER LIDAR SCIENCE EXPERIMENTS AND OPERATIONS PLANS FOR 1981 AIRBORNE TEST FLIGHT
George H. Fichtl, James W. Bilbro, and John W. Kaufman Apr. 1981 120 p
(NASA-TM-85160; NAS 1.15:85160) Avail: NTIS HC A06/MF a01 CSCL 04B

The flight experiment and operations plans for the Doppler Lidar System (DLS) are provided. Application of DLS to the study of severe storms and local weather penomena is addressed. Test plans involve 66 hours of flight time. Plans also include ground based severe storm and local weather data acquisition. N.W.

N83-13703# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Div. de Aplicacoes Meteorologicas.
AN INTRODUCTION TO PROJECT FREEZE [PROJETO GEADA: APRESENTACAO]
F. C. Almeida Jun. 1982 30 p refs In PORTUGUESE; ENGLISH summary
(INPE-2435-NTE/186) Avail: NTIS HC A03/MF A01

The use of infrared imagery from meteorological satellites to record and locate freezing temperatures in subtropical Brazil is described. Techniques employed during the testing phase of the project are examined. The use of environmental satellites for freeze monitoring and the application of these methods to monitor the severe frosts of the winter of 1981 are discussed. Transl. by J.D.

N83-13704# Forest Service, New Orleans, La. Southern Forest Experiment Station.
RESEARCH NOTE: RAINFALL DATA SIMULATION
T. L. Rogerson 1980 8 p refs
(SO-260) Avail: NTIS HC A02/MF A01

A simple simulation model to predict rainfall for individual storms in central Arkansas is described. Output includes frequency distribution tables for days between storms and for storm size classes; a storm summary by day number (January 1 = 1 and December 31 = 365) and rainfall amount; and an annual storm summary that includes monthly values for rainfall and number of storms. The model should be adaptable to other areas where 10 or more years of rainfall records are available. Author

N83-13705*# Lassen Research, Manton, Calif.
SEVERE STORMS DOPPLER LIDAR SIGNAL PROCESSING Final Report
R. W. Lee 1 Oct. 1982 4 p refs
(Contract NAS8-34768)
(NASA-CR-169557; NAS 1.26:169557) Avail: NTIS HC A02/MF A01 CSCL 04B

The recommended algorithm for the correction of higher order data errors in severe storms Doppler lidar signal processing is discussed. R.J.F.

N83-13706*# Lassen Research, Manton, Calif.
NASA AIRBORNE DOPPLER LIDAR PROGRAM: DATA CHARACTERISTICS OF 1981 Final Technical Report
R. W. Lee Apr. 1982 122 p
(Contract NAS8-34768)
(NASA-CR-170667; NAS 1.26:170667; FTR-1) Avail: NTIS

HC A06/MF A01 CSCL 04B

The first flights of the NASA/Marshall airborne CO2 Doppler lidar wind measuring system were made during the summer of 1981. Successful measurements of two-dimensional flow fields were made to ranges of 15 km from the aircraft track. The characteristics of the data obtained are examined. A study of various artifacts introduced into the data set by incomplete compensation for aircraft dynamics is summarized. Most of these artifacts can be corrected by post processing, which reduces velocity errors in the reconstructed flow field to remarkably low levels. Author

N83-13707# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

IMAGE ANALYSIS UNIT (UAI-R) FOR METEOROLOGICAL APPLICATIONS [UNIDADE DE ANALISE DE IMAGENS PARA APLICACOES METEOROLOGICAL UAI-R]

Jun. 1982 10 p In PORTUGUESE Original contains color illustrations

(INPE-2428-NTE/185) Avail: NTIS HC A02/MF A01

The remote version of the image analysis unit (UAI-R) is described. The UAI acquires and animates images obtained by the GOES satellite which are shown on a black and white or color television screen. The images are transmitted by telephone (1200 bits/sec) in real time from the master unit (UAI-M) which is coupled to the INPE GOES station. Estimated user fees are presented. Meteorological information from the prototype UAI-1 is used in synoptic weather forecasting, precipitation estimation, forecasting and observation of frosts, and observation of ocean currents. J.D.

N83-13708# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ARTIFICIAL WEATHER MODIFICATION. PRECIPITATION MANAGEMENT [MODIFICACAO ARTIFICIAL DO TEMPO. GERENCIAMENTO DA PRECIPITACAO]

Fausto Carlos deAlmeida Oct. 1981 7 p refs In PORTUGUESE Presented at the 4th Brazilian Symp. on Hydrol. and Hydrol. Resources, 15-19 Nov. 1981, Fortaleza, Brazil

(INPE-2252-PRE/035) Avail: NTIS HC A02/MF A01

The state of the art of weather modification techniques is surveyed. The suppression of hail, increase of precipitation, and fog dispersal are considered. The results of weather modification, the difficulties of evaluating it, and problems with the transfer of those results from one region to another are discussed. A method for increasing precipitation within the larger context of weather management for a given region is described. J.D.

N83-13709*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE UTILIZATION OF NIMBUS-7 SMMR MEASUREMENTS TO DELINEATE RAINFALL OVER LAND

Edward Rogers and Honnappa Siddalingaiah (OAO Corp., Greenbelt, Md.) Nov. 1982 62 p refs Submitted for publication

(NASA-TM-84934; NAS 1.15:84934) Avail: NTIS HC A04/MF A01 CSCL 04B

Based on previous theoretical calculations, an empirical statistical approach to use satellite multifrequency dual polarized passive microwave data to detect rainfall areas over land was initiated. The addition of information from a lower frequency channel (18.0 or 10.7 GHz) was shown to improve the discrimination of rain from wet ground achieved by using a single frequency dual polarized (37 GHz) channel alone. The algorithm was developed and independently tested using data from the Nimbus-7 Scanning Multichannel Microwave Radiometer. Horizontally and vertically polarized brightness temperature pairs at 37, 18, 10.7 GHz were sampled for raining areas over land (determined from ground base radar), wet ground areas (adjacent and upwind from rain areas determined from radar), and dry land regions (areas where rain had not fallen in a 24h period) over the central and eastern United States. Surface thermodynamic temperatures were both above and below 15 deg C. R.J.F.

N83-13710*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE GLAS PHYSICAL INVERSION METHOD FOR ANALYSIS OF HIRS2/MSU SOUNDING DATA

J. Susskind, J. Rosenfield (Sigma Data Services Corp.), D. Reuter, and M. T. Chahine (JPL, California Inst. of Tech., Pasadena) Nov. 1982 108 p refs

(NASA-TM-84936; NAS 1.15:84936) Avail: NTIS HC A06/MF A01 CSCL 04B

Goddard Laboratory for Atmospheric Sciences has developed a method to derive atmospheric temperature profiles, sea or land surface temperatures, sea ice extent and snow cover, and cloud heights and fractional cloud, from HIRS2/MSU radiance data. Chapter 1 describes the physics used in the radiative transfer calculations and demonstrates the accuracy of the calculations. Chapter 2 describes the rapid transmittance algorithm used and demonstrates its accuracy. Chapter 3 describes the theory and application of the techniques used to analyze the satellite data. Chapter 4 shows results obtained for January 1979. Author

N83-13711*# Miami Univ., Fla. Div. of Meteorology and Physical Oceanography.

TROPICAL DISTURBANCES IN RELATION TO GENERAL CIRCULATION MODELING Final Technical Report, 1 May 1979 - 31 Oct. 1982

Mariano A. Estoque 31 Oct. 1982 231 p refs

(Grant NsG-5342)

(NASA-CR-169522; NAS 1.26:169522) Avail: NTIS HC A11/MF A01 CSCL 04B

The initial results of an evaluation of the performance of the Goddard Laboratory of Atmospheric Simulation general circulation model depicting the tropical atmosphere during the summer are presented. Because the results show the existence of tropical wave disturbances throughout the tropics, the characteristics of synoptic disturbances over Africa were studied and a synoptic case study of a selected disturbance in this area was conducted. It is shown that the model is able to reproduce wave type synoptic disturbances in the tropics. The findings show that, in one of the summers simulated, the disturbances are predominantly closed vortices; in another summer, the predominant disturbances are open waves. A.R.H.

N83-13712# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

USE OF GEOSTATIONARY SATELLITE IMAGERY TO ESTIMATE CONVECTIVE PRECIPITATION OVER COMPLEX TERRAIN IN THE WESTERN UNITED STATES M.S. Thesis - Utah Univ.

David Paul Urbanski Aug. 1982 81 p refs

(AD-A119072; AFIT/CI/NR/82-21T) Avail: NTIS HC A05/MF A01 CSCL 04/2

The primary objective of this study was to develop a technique that used geosynchronous satellite images to estimate local convective precipitation in the complex terrain of the Intermountain West. This technique is a modification of previous methods that were developed for moist tropical air masses over the central United States where orographic influences are generally not important. Visible and enhanced infrared satellite images were compared with more than 870 hourly precipitation measurements over the states of Colorado, Idaho, Nevada, Utah, and Wyoming, for several of the summer months between 1978 and 1981. Two methods of modifying the precipitation estimation technique to account for the dry environment of this region were carried out and compared. An orographic enhancement factor was developed to include the effects of rugged mountainous terrain. Rainfall estimates produced by this technique are presented and compared with previous methods. The results showed improvement in precipitation estimates from GOES enhanced infrared imagery when terrain influences were included. This technique may be useful for real-time estimates of convective precipitation amounts and has potential for application to flash flood forecasting in the western United States. GRA

N83-13713# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PERIODIC INTERANNUAL VARIATIONS OF MIDWESTERN UNITED STATES TEMPERATURES IN DECEMBER
M.S. Thesis
Douglas Carl Pearson 1982 76 p refs
(AD-A119025; AFIT/CI/NR/82-31T) Avail: NTIS HC A05/MF A01 CSCL 04/2

Three strong periodicities are observed in the time series of December temperature at St. Cloud, Minnesota (1893-1980). These three frequencies (.3868 cycles/year, .2263 cycles/year, and .1132 cycles/year) are shown to have a time and space 'sensitivity.' December is a sensitive time because synoptic flow patterns are transitional from a fall regime (i.e., a Gulf of Alaska low) to a winter regime (i.e., an Aleutian low). The north-central United States is a sensitive area because mean air mass confluence zones (i.e., stronger temperature gradients) lie in and near this region in December. A periodic shifting of the pressure pattern (forcing) should result in similar periodic changes in the temperature pattern (response) in sensitive locations near strong mean temperature gradients. This hypothesis is tested using temperature data across the United States and Canada. Because temperature patterns are related to synoptic pressure patterns, pressure data (1899-1978) are examined for analogous frequencies. The results indicate that the region of northwest Canada may force a response in temperature data 2600 km to the southeast. GRA

N83-13714# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
WIND-ENERGY PROGRAM: FY 1982 THIRD QUARTERLY REVIEW
Richard Mitchell, Robert J. Noun, Theresa Flaim, Martin Deutsch, Susan Hock, Howard Sklar, and Neil D. Kelley Aug. 1982 33 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-019928; SERI/PR-211-1672) Avail: NTIS HC A03/MF A01

The objective, accomplishments, planned activities, output, and subcontracts are briefly summarized for each of the following tasks of the Wind Energy Program: program management and planning, wind energy conversion systems (WECS) application in nongenerating utilities, technical feasibility of stand-alone small WECS (SWECS), WECS performance/value analysis, wind energy industry analysis, wind systems coordination, wind workshops, noise and television interference studies, and advanced and innovative wind energy concepts. Each task summary includes a milestone chart. Also given are lists of research and development subcontracted projects for FY 1981 and FY 1982, principal subcontractors for FY 1982 projects, and current Wind Energy Program publications. DOE

N83-13715# World Meteorological Organization, Geneva (Switzerland).
THE EFFECT OF METEOROLOGICAL FACTORS ON CROP YIELDS AND METHODS OF FORECASTING THE YIELD
1982 63 p refs
(WMO-566; IN-174; ISBN-92-63-10566-9) Avail: NTIS MF A01; print copy available from WMO, Geneva

Agrometeorological factors in potato, sugar beet, sunflower, cotton, sugar cane, coffee and cocoa yields are summarized. Mathematical modeling of plant growth and yield is discussed. Statistical approaches are inadequate to explain why yield has a close correlation with any particular factor. Crop growth simulation models are needed to define yield as functions of physical chemical and physiological factors, and their interdependencies.
Author (ESA)

N83-13716# National Weather Service, Washington, D.C. Climate Analysis Center.
PROCEEDINGS OF THE 6TH ANNUAL CLIMATE DIAGNOSTICS WORKSHOP
Jay S. Winston Mar. 1982 351 p refs Workshop held at Palisades, N.Y., 14-16 Oct. 1981
(PB82-219486; NOAA-82042008) Avail: NTIS HC A16/MF A01 CSCL 04B

The past year's climate, recent climate variations and other circulation relationships were anayzed. Land surface conditions and short term climate fluctuations are discussed. Tropical middle latitude interrelationships and radiation budget and observational analysis problems are outlined. Climate prediction and statistical significance of correlated meteorological data and some diagnostic energetics of the European center's medium range forecasts are considered. For individual titles, see N83-13717 through N83-13760.

N83-13717# National Meteorological Center, Washington, D.C.
NORTHERN HEMISPHERIC CIRCULATION AND US WEATHER, FALL 1980 - SUMMER 1981
Robert R. Dickson *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 1-15 (For primary document see N83-13716 04-47)
(PB82-219494) Avail: NTIS HC A16/MF A01 CSCL 04B

The atmospheric circulation in the Northern Hemisphere from the fall of 1980 through the summer of 1981 is discussed. Changes in weather patterns are outlined, however, seasonal mean temperature anomalies were generally not extreme. Extreme droughts which caused water shortages, unseasonally warm weather, a few extreme cold spells, and early snow in October are reported. E.A.K.

N83-13718# Atmospheric Environment Service, Downsview (Ontario).
CLIMATE EXTREMES AND IMPACTS OVER CANADA FROM SEPTEMBER 1980 TO AUGUST 1981
Yves Durocher *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 16-24 (For primary document see N83-13716 04-47)
(PB82-219502) Avail: NTIS HC A16/MF A01 CSCL 04B

The impact of climate extremes is discussed. The period from September 1980 to August 1981 was warmer than normal for most of Canada. Mean temperatures for this period exceeded normal by more than 1 C over the entire western half of the country and by more than 2 C over most of the Prairies. All negative anomalies were concentrated in the populated areas of southern Ontario and Quebec and fruit crops suffered losses following a record cold outbreak during the holiday season and late frost in the spring. The precipitation totals for this period show wet zones along all coastal areas with extensions into southern British Columbia and along the Saint Lawrence Valley which coincided with rotting crops in many areas. The dry areas over the northern Prairie provinces and Ontario threatened timber areas. Due to the timely arrival of cool air and precipitation, most areas did not suffer extensive damage. E.A.K.

N83-13719# Lamont-Doherty Geological Observatory, Palisades, N. Y.
PERSISTENCE AS A FEATURE OF 1980-81 CLIMATE
R. A. Goldberg and W. L. Donn *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 25-27 refs (For primary document see N83-13716 04-47)
(Grant NA79AA-D-00066)
(PB82-219510; Contrib-3248) Avail: NTIS HC A16/MF A01 CSCL 04B

Persistence in predicting mean monthly temperature anomalies for June 1980 to May 1981 was examined. Several different verification techniques are used and compared, included are: (1) percentage of signs predicted correctly; (2) percentage of climatological categories predicted correctly; (3) skill scores based on percentage correct of signs and categories; (4) root mean square errors; and (5) skill scores based on mean square errors of persistence relative to climatology. Persistence in the prediction of mean monthly temperature anomalies was evaluated over a 10 years period and is based on the use of climate categories only. It is shown that on the average the percent correct of persistence exceeded climatological chance by about 9%. It is found that the performance of persistence reached a maximum

during August and was at a minimum during May and November. E.A.K.

N83-13720# East Anglia Univ., Norwich (England). Climatic Research Unit.
NORTHERN HEMISPHERE SURFACE AIR TEMPERATURE: 1881 - 1981
P. M. Kelly and P. D. Jones *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 28-31 refs (For primary document see N83-13716 04-47)
Avail: NTIS HC A16/MF A01 CSCL 04B

Station surface air temperature data, expressed as departures from the 1946-60 mean, were interpolated onto a 5 deg latitude by 10 deg longitude grid. The gridpoint values were areally weighted and averaged to give an estimate of average monthly temperature variations for the Northern Hemisphere (0-85 deg N), over the period January 1881 to August 1981. It is noted that this Northern Hemisphere average is largely representative of conditions over the land masses only, and that the spatial coverage of the gridded data varies throughout the period of record. The limitations of the data set in detail are discussed, and attempts to obtain hemispheric averages are compared. E.A.K.

N83-13721# National Meteorological Center, Washington, D.C. Climate Analysis Center.
THE CIRCULATION OVER THE TROPICS DURING 1980-81
Arthur F. Krueger *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 32-44 refs (For primary document see N83-13716 04-47)
(PB82-219536) Avail: NTIS HC A16/MF A01 CSCL 04B

This was a year during which the SPCZ was again located east of Indonesia New Guinea. During much of the year the tropical convergence was also more active over Central America and the Atlantic. The Caribbean circulation was disturbed rather frequently as was that over the northwestern tropical Pacific. Over the equatorial Atlantic, however, the dry zone extended west of normal into northeastern Brazil which suggests strong South Atlantic tradewinds. The southern oscillation index (SOI) exhibited minor but essentially negative fluctuations during the past 3 years, although a large increase occurred since spring 1981. The longwave cooling and tradewind indices reflect this. The 200 mb zonal winds along the equator over the east Pacific show an upward trend for nearly 2 years and were positive during the first half of 1981. The relative angular momentum anomaly for the Earth as a whole remains positive which indicated a greater strength of the general circulation over recent years. Its fluctuations appear to be negatively correlated with the SOI. E.A.K.

N83-13722# National Meteorological Center, Washington, D.C. Climate Analysis Center.
SEA SURFACE (AND SUBSURFACE) TEMPERATURES FOR SEPTEMBER 1980 - SEPTEMBER 1981
Richard W. Reynolds *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 45-56 refs (For primary document see N83-13716 04-47)
(PB82-219544) Avail: NTIS HC A16/MF A01 CSCL 04B

The sea surface temperatures (SST), obtained from the SST global anlysis are discussed. The analysis shows differences of several degrees-C when compared with other analyses. The differences are primarily due to an analysis period (every other day) which is too frequent for the number of ship observations south of 20 N. The analysis relies on satellite GOSSTCOMP observations. These observations have severe biases. However, the important climatic features are shown. E.A.K.

N83-13723# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
THE WINTER SNOW COVER DROUGHT OF 1980-81
Michael Matson and Marylin S. Varnadore *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 57-63 refs (For primary document see N83-13716 04-47)
(PB82-219551) Avail: NTIS HC A16/MF A01 CSCL 04B

The computer of 1980-81 which had lack of snow cover in large areas of North American and Eurasia is discussed. In North America average winter snow cover extent as detected by the NOAA satellites declined for the second consecutive winter, reaching a 15 year record low. This was 1.7 x 106 km lower than the 14 year average of 16.9 x 106 km and exceeded by 2.4 times the 14 year standard deviation of 0.7 x 106 km2. For the third consecutive year Eurasian average winter snow cover extent also declined. Snow cover extent dropped 10 25.3 x 106 km2, a low only exceeded by the 1970-71 winter when average winter snow cover extent was 24.4 x 106km2. The 1980-81 Eurasian average winter snow cover extent was 2.9 x 106km2 lower than the 14 year average of 28.2 x 106km2 and exceeded by 1.5 times the 14 year standard deviation of 2.0 x 106km2. E.A.K.

N83-13724# Lamont-Doherty Geological Observatory, Palisades, N. Y.
POTENTIAL IMPACT OF SNOW AND ICE VARIATIONS ON THE HEAT BUDGET
G. Kukla and J. Gavin *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 64-71 refs (For primary document see N83-13716 04-47)
(PB82-219569) Avail: NTIS HC A16/MF A01 CSCL 04B

Snow and ice, surface albedo and the potential shortwave energy absorption at the surface of weekly snow and sea ice charts were analyzed. Snow and ice cover between December 1980 and April 1981 over much of the northern hemisphere was less extensive than in the previous year. It was found, however, that during the first half of November 1980, snow was considerably more extensive in Europe, Asia and North America than in 1979. It is noted that in May and June of 1981 the snow remained longer in the eastern half of North America, western Asia and Europe while sea ice in the North Atlantic was more extensive than the previous year. E.A.K.

N83-13725# National Meteorological Center, Washington, D.C. Climate Analysis Center.
HEMISPHERIC 700-mb HEIGHT PATTERNS DURING THE US HEAT WAVES OF SUMMER 1980 AND SOME EARLIER YEARS
Carl O. Erickson *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 72-78 refs (For primary document see N83-13716 04-47)
(PB82-219577) Avail: NTIS HC A16/MF A01 CSCL 04B

Over the contiguous United States, the summers of 1952, 1953, 1954, and 1980 were among the hottest, nationwide, since the 1930s. June July August 700 mb contours and height anomalies over the Northern Hemisphere for each of those four summers are shown. Similarities are the pattern of three anticyclonic anomalies centered over the eastern Pacific, the U. S., and the North Atlantic, respectively, the so called 3-wave pattern. Those three anomaly centers vary somewhat in strength and position, but all three are present in each of the four summers. The prevalence of above-normal 700-mb heights at middle and lower latitude during these four hot summers (1952, 1953, 1954, 1980) and a seeming tendency for heights to increase, relative to normal, during the springs and early summers of those years are examined. E.A.K.

N83-13726# National Oceanic and Atmospheric Administration, Asheville, N. C. Climatological Analysis Div.
A HISTORICAL PERSPECTIVE OF THE 1980-81 DROUGHT AND ASSOCIATED TEMPERATURE ANOMALIES IN THE USA
Thomas R. Karl *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 79-86 refs (For primary document see N83-13716 04-47)
(PB82-219585) Avail: NTIS HC A16/MF A01 CSCL 04B

An 87-year data set (1895-July 1981) consisting of statewide monthly averages of precipitation and temperature are used to assess the 1980 and 81 drought and associated heat wave. Since statewide averages are used there are a few instances when very dry portions of some states are averaged with very wet portions of the same state giving the appearance of near normal conditions. This is not considered a serious problem paper as only large-scale

events (droughts and heat waves which span several states) are of interest. The Palmer Drought Severity Index was calculated for each state using the monthly averages of precipitation and temperature. R.J.F.

N83-13727# Wisconsin Univ., Madison. Center for Climatic Research.
THE MAJOR CIRCULATION WHIFT OF FEBRUARY 1981 AS REVEALED BY REAL-TIME MONITORING OF WINDFIELD EIGENVECTORS
Klaus M. Weickmann *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 87-94 refs (For primary document see N83-13716 04-47)
(PB82-219593) Avail: NTIS HC A16/MF A01 CSCL 04B

The results of an analysis using 7 years of outgoing longwave radiation data relative to the relationship between intraseasonal fluctuations in tropical cloudiness and expansions or contractions of major atmospheric jet streams are discussed as well as the relations between the radiation eigenvectors and the circulation eigenvectors. Following these general considerations, a specific example of a major circulation fluctuation which occurred in Feb 81 is discussed. R.J.F.

N83-13728# Scripps Institution of Oceanography, La Jolla, Calif.
THE NEW SCRIPPS ATLAS OF 700-mb HEIGHT TELECONNECTIONS: SOME NOVEL FINDINGS
Jerome Namias *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 95-104 (For primary document see N83-13716 04-47)
(PB82-219601) Avail: NTIS HC A16/MF A01 CSCL 04B

A seasonal collection of teleconnections is illustrated, showing the large coherent area frequently observed in winter over the central and western Pacific, which breaks down into smaller coherent areas during the summer, a manifestation of shorter quasi-stationary Rossby waves as the zonal mid-latitude wind speed diminishes from winter to summer. Summer teleconnections associated with drought over the Great Plains are shown. R.J.F.

N83-13729# Arizona Univ., Tucson. Lab. of Tree-Ring Research.
SEASONAL RELATIONSHIPS OF SEA LEVEL PRESSURE OVER THE NORTH PACIFIC AND TEMPERATURE AND PRECIPITATION OVER NORTH AMERICA
G. Robert Lofgren *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 105-113 (For primary document see N83-13716 04-47)
(PB82-219619) Avail: NTIS HC A16/MF A01 CSCL 04B

Relationships existing between the climatic variables of temperature and precipitation over the western United States and sea level pressure anomalies over the North Pacific and over North America were studied and the same determination for temperature and precipitation over the central and eastern United States during the first 70 years of the 20th Century was made. Monthly variables of temperature, precipitation and sea level pressure were grouped into seasons. Temperature and precipitation stations were carefully selected and tested before inclusion in their respective grids. Temperature and precipitation stations were selected for completeness of record. Stations with more than two months of missing data for the first 70 years in the twentieth century were rejected. A regression technique using three nearby stations was used when necessary to estimate one or two months of missing data. The homogeneity of each station record was checked using a cumulative temperature analysis to compare pairs of nearby stations. R.J.F.

N83-13730# British Columbia Univ., Vancouver. Dept. of Geography.
THE BAFFIN ISLAND PARADOX
John L. Knox *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 114-119 ref (For primary document see N83-13716 04-47)
(PB82-219627) Avail: NTIS HC A16/MF A01 CSCL 04B

A study of the spatial and temporal distribution of blocking in the Northern Hemisphere during the 33-year period 1946 to 1978 inclusive is discussed. The technique used to identify blocking episodes as based on a number of well-known characteristics of blocking anticyclones, e.g., mid- to high-latitude location, persistence, and characteristic quasi-barotropic structure in mid- and upper-tropospheric layers. The rationale for the technique is presented. Essentially it is based on the fact that blocking episodes are strongly related to positive anomalies of 5-day mean 500-mb height. It was found that if the product of the pentad-normalized positive aomaly center magnitude and latitude exceeded an empirically derived threshold, then the likelihood of the anomaly center being associated with the occurrence of blocking during the 5-day period was greater than 80%. R.J.F.

N83-13731# Environmental Research and Technology, Inc., Concord, Mass.
VIEWING THE GENERAL CIRCULATION ON SHORT TIME SCALES
Richard D. Rose and David A. Salstein *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 120-127 (For primary document see N83-13716 04-47)
(PB82-219635) Avail: NTIS HC A16/MF A01 CSCL 04B

To study the effect of the choice of averaging period on various circulation statistics, the winter of 1976-77 is divided into a number subperiods. The eddy fluxes of momentum and heat are calculated during each of these subperiods using values from the NMC global analysis. B.W.

N83-13732*# Environmental Research and Technology, Inc., Concord, Mass.
PATTERNS IN ZONAL WINDS AND ATMOSPHERIC ANGULAR MOMENTUM DURING A RECENT 5-YEAR PERIOD
David A. Salstein and Richard D. Rosen *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 128-134 refs (For primary document see N83-13716 04-47)
(Contract NAS5-25870)
(PB82-219643) Avail: NTIS HC A16/MF A01 CSCL 04B

Zonal wind values from the twice-daily NMC global analysis have been assembled in zonally averaged form for the period 1976-1980. From these, a time series of the total angular momentum of the atmosphere, M, has been computed. Variations in the distribution of angular momentum are studied separately in both height and latitude for the purpose of determining which regions are most responsible for the variations in M. B.W.

N83-13733*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
CLIMATIC SENSITIVITY TO VARIATIONS IN VEGETATED LAND SURFACE ALBEDOES
A. Henderson-Sellers (Liverpool Univ.) *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 135-145 (For primary document see N83-13716 04-47)
Avail: NTIS HC A16/MF A01 CSCL 04B

The climatic effects of tropical deforestation in the Brazilian Amazon region have been simulated using the G.I.S.S. G.C.M. All the physical characteristics associated with the vegetation change (rainforest to grass/crop in 78 deg x 10 deg grid squares) were included viz. seasonal albedo (visual and near I.R.); soil moisture holding capacity in both ground layers; masking depth; roughness length and the perturbations caused in the global level of CO_2. The climate of the region is well simulated by the standard model, which includes fixed ocean transport. Results from this simulation show a significant decrease in precipitation and a less obvious temperature increase for the Amazon region along with considerable modifications in the local hydrology. Regional scale effects are minor and the only global perturbation is as a result of the small addition of CO_2. B.W.

N83-13734*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THE INFLUENCE OF GROUND MOISTURE CONDITIONS ON SUMMERTIME CLIMATE AS MODELED IN A GCM

D. Rind *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 145-151 (For primary document see N83-13716 04-47)
(PB82-219650) Avail: NTIS HC A16/MF A01 CSCL 04B

To test the influence of the ground moisture on the summertime climate the GISS general circulation model is used. The version used had 8 x 10 deg horizontal resolution and 9 layers in the vertical. This version produces a good simulation of the current climate. B.W.

N83-13735# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
EFFECTS OF SURFACE BOUNDARY CONDITIONS ON CONTINENTAL PRECIPITATION COMPUTED WITH THE GISS CLIMATE MODEL
J. Spar (City Coll. of the City Univ. of New York) and C. Cohen (City Coll. of the City Univ. of New York) *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 151-157 refs (For primary document see N83-13716 04-47)
(Grant NGR-33-013-086)
(PB82-219668) Avail: NTIS HC A16/MF A01 CSCL 04B

The GISS coarse mesh (8 deg of latitude by 10 deg of longitude) 7-layer global general circulation model was run in a 'perpetual January' mode to generate four model climatologies by averaging the last 20 of each of four sets of 25 successive mean January states. The model was run with: (a) flat, dry (zero soil moisture) continents, (b) mountainous, wet continents (including two layers of soil moisture)-all these runs being done with a zonally symmetric sea-surface temperature (SST) pattern-, and (d) mountainous, wet continents with a climatologically realistic SST field. The model was initialized with specified initial meridional and vertical gradients of temperature and humidity for run (a), and with dry isothermal conditions for runs (b), (c), and (d), and allowed to spin up from rest in all four runs. To investigate the effects of topography, soil moisture, and sea surface temperature variations on continental precipitation, the four model rainfall climatologies were compared in detail over Australia, Africa, and South America. B.W.

N83-13736# Nebraska Univ., Lincoln. Dept. of Geography.
VARIATIONS IN NORTHERN HEMISPHERE SNOW COVER UTILIZING DIGITIZED WEEKLY CHARTS DERIVED FROM SATELLITE IMAGERY, 1967 - 1980
Kenneth F. Dewey and Richard Heim, Jr. *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 157-165 refs (For primary document see N83-13716 04-47)
(Grant NA80AA-A-02240)
(PB82-219676) Avail: NTIS HC A16/MF A01 CSCL 04B

The development of a digitized snow and ice cover data base is described. The data were derived from the weekly Northern Hemisphere snow and ice charts maintained since 1966. These charts are based upon photo interpretation of 6 or 7 consecutive days of satellite imagery, and the snow and ice boundaries drawn on a 1:50,000,000 polar stereographic projection of the Northern Hemisphere. The charts were digitized using an 89x89 element matrix covering almost all of the Northern Hemisphere. The latitude and longitude of each of the 7,921 land grid boxes and the exact geographic area of each box (which varies with latitude) was stored in the data archive. Examples of the products which can be derived from an analysis of the snow data in the data base are presented. J.D.

N83-13737# Lamont-Doherty Geological Observatory, Palisades, N. Y.
SPRING SURFACE REFLECTIVITY AND SURFACE TEMPERATURES IN ALASKA
David A. Robinson *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 166-169 refs (For primary document see N83-13716 04-47)
(PB82-219684) Avail: NTIS HC A16/MF A01 CSCL 04B

A strong association between temperatures and surface albedo in Alaska in spring is demonstrated. This relationship is a partial function of the amount of energy locally available for surface heating, which in spring is principally controlled by the extent of snow cover. NOAA Very High Resolution Radiometer (VHRR) and Advanced VHRR (.6-.7 microns) imagery of Alaska taken in the springs of 1979-1981 was examined. An image processor was used to measure surface brightnesses of three select regions of the state when skies were clear. Brightnesses were converted to estimated surface albedos by linear interpolation. Resultant spring albedo curves for each region were compared with surface temperatures from ground stations within each region. The close association between sharply decreasing surface albedo and rapidly rising temperatures seen in all regions in each of the three springs is shown. The significance of surface albedo as an active factor influencing spring temperatures and snow melt was investigated. J.D.

N83-13738# Scripps Institution of Oceanography, La Jolla, Calif.
MULTISEASON CONTINGENCIES OF US TEMPERATURE
Daniel R. Cayan *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 178-185 (For primary document see N83-13716 04-47)
(PB82-219700) Avail: NTIS HC A16/MF A01 CSCL 04B

Weekly maps of snow cover were used to evaluate the relationships between the distributions of snow, surface temperature, and 700 mb height over the United States. The analysis includes the four month period December to March of the years 1949 to 50 through 1978 to 79. The snow data consist of the latitudinal extent of 1 inch and 6 inch snow coverage at eleven longitudes in the United States: 70 W, 75 W, ..., 120 W. Digitized snow data were interpolated to common dates. Departures from the weekly normal surface temperatures were digitized for 38 points within the United States. The seasonal cycle of the 30 year mean extent of one inch snow coverage averaged over all 11 longitudes illustrates the stability of the 30 year statistics. J.D.

N83-13739# Clark Univ., Worcester, Mass. Graduate School of Geography.
RAINFALL FLUCTUATIONS IN SUBTROPICAL AFRICA. INTERHEMISPHERIC TELECONNECTIONS
Sharon E. Nicholson *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 186-196 (For primary document see N83-13716 04-47)
(PB82-219718) Avail: NTIS HC A16/MF A01 CSCL 04B

Examples are shown of contingencies of tercile classes of temperature for about 80 years of seasonal data for the coterminous U.S. Contingency tables offer some insight into possible nonlinear behavior of the temporal relationships of temperature. A hypothetical example of this nonlinear behavior would be warm springs leading to warm summers with cool springs not leading to cool summers. J.D.

N83-13740# Clark Univ., Worcester, Mass. Graduate School of Geography.
RAINFALL FLUCTUATIONS IN SUBTROPICAL AFRICA. INTERHEMISPHERIC TELECONNECTIONS
Sharon E. Nicholson *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 186-196 (For primary document see N83-13716 04-47)
(PB82-219718) Avail: NTIS HC A16/MF A01 CSCL 04B

An investigation into droughts in the Sahel/Saharan regions and in the Kalihari, based on 1100 African stations for which rainfall records generally commence in the 1920s or earlier is summarized. The results of two analyses are summarized: regional rainfall departures corresponding to major anomaly patterns, and meridional cross sections illustrating rainfall seasonality. In all cases, the analyses are preliminary and conclusions still tentative: they are based initially on the subset of northern hemisphere stations and newly acquired data for southern African stations are stratified according to these results. Furthermore, the regional divisions for Central and Southern Africa are based on climatological characteristics; an objective regionalization must still be carried out. J.D.

N83-13741# Ohio State Univ., Columbus. Dept. of Geography.
TELECONNECTIONS TO VARIATIONS IN THE STRENGTH OF THE SOUTHERN HEMISPHERE WESTERLIES
Jeffrey C. Rogers *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 197-208 (For primary document see N83-13716 04-47)
(PB82-219726) Avail: NTIS HC A16/MF A01 CSCL 04B

The teleconnections of sea level pressure (SLP), 500 mb height, and air temperature on the Southern Hemisphere are examined. The spatial variability of mean SLP and 500 mb height anomalies over the Southern Hemisphere during summer and winter was initially determined by using eigenvector analysis based on daily synoptic maps. The patterns of spatial distribution of pressure and height anomalies were verified and further examined by means of station data. The pattern is predominantly zonal and is characterized by an opposition in the sign of anomaly between latitudes equatorward of 50 S with those poleward of 50 S. The position of the highest positive values along about 40 S indicates a tendency for the westerlies and trades to weaken and strengthen simultaneously. The first eigenvectors of SLP and 500 mb height in summer are similar to those of winter. S.L.

N83-13742# Rutgers Univ., New Brunswick, N. J. Dept. of Meteorology and Physical Oceanography.
ASSOCIATIONS AMONG THE TROPICAL PACIFIC WIND AND SST FIELDS AND HIGHER LATITUDE CIRCULATION
Robert Harnack and John Lanzante *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 209-220 (For primary document see N83-13716 04-47)
(PB82-219734) Avail: NTIS HC A16/MF A01 CSCL 04B

Associations between seasonal trade wind and sea surface temperature fields in the eastern half of the tropical Pacific Ocean were studied. In addition, the tropical fields were statistically related to the extratropical circulation of Northern Hemisphere (i.e., 700-mb heights). The trade wind field was examined primarily in terms of the horizontal trade wind divergence. In addition, seasonally stratified lag relationships were computed. The long term mean fields of trade wind divergence were examined for each season type. The winter pattern (which is similar to that for the other seasons) is shown. A zonally oriented convergence band (indicative of the ITCZ) is centered at about 8 N. Mean divergence is found everywhere else except for the southwest area. Seasonal shifts of the convergence was noted. Empirical orthogonal function (EOF) analysis was used extensively. The explained variances for those EOF's selected (by using a graphical technique) as being nonrandom are shown. S.L.

N83-13743# Hawaii Univ., Honolulu. Dept. of Oceanography.
EL NINO OUTLOOK FOR 1982
Klaus Wyrtki *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 221-222 (For primary document see N83-13716 04-47)
(PB82-219742) Avail: NTIS HC A16/MF A01 CSCL 04B

The oceanic and atmospheric conditions which set the stage for the possible occurrence of an El Nino event are examined. According to past observations and to theory, El Nino is preceded by stronger equatorial upwelling and intensification of westward flow in the south equatorial current. This in turn leads to the accumulation of excessive amounts of warm water in the western equatorial Pacific, to a depression of the thermocline, and to an increase in sea level. The existence of such conditions can be determined by monitoring the winds, the sea surface temperatures, and sea level. The winds as derived from the low level cloud motion vectors over the region 5 N to 5 S and 140 W to 180 W were only about 5% stronger than normal. While preceding the 1976 El Nino they were 15% above normal. S.L.

N83-13744# National Meteorological Center, Washington, D.C. Climate Analysis Center.
RELATIONS AMONG THE STRATOSPHERIC AND TROPOSPHERIC JET FLOWS AND THE SOUTHERN OSCILLATION IN THE CONTEXT OF ROSSBY WAVE PROPAGATION
R. S. Quiroz *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 223-228 (For primary document see N83-13716 04-47)
(PB82-219759) Avail: NTIS HC A16/MF A01 CSCL 04B

Relationships among five variables were examined on the basis of 13 years of monthly data: (1) anomaly (departure from long period mean) of stratospheric high latitude mean zonal flow (30 mb, 65 N), (2) anomaly of mean zonal flow in the region of the tropospheric subtropical jet (200 mb, 33 N), (3) anomaly of zonal flow in the equatorial east Pacific (200 mb, 165 to 110 W), (4) a southern oscillation index (Tahiti-Darwin), and (5) 30 mb zonal wind anomaly near the equator (Balboa, C.Z.), to represent the stratospheric quasibiennial oscillation. The data were analyzed using various time stratifications, including no smoothing of the monthly anomalies. Calendar dependent lag correlations were obtained, supplemented by cross spectrum analysis of all possible pairs among the 5 variables. The variables shown are based on 5 month binomial smoothing for better visual perception. The correlation results are based on 3 month average anomalies determined for successive months. Complete results, including a discussion of differences in regional zonal winds and latitudinal zonal mean winds, are given. S.L.

N83-13745# Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.
OBSERVATIONAL NETWORK AND CLIMATE MONITORING
Douglas G. Hahn and Syukuro Manabe *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 229-235 refs (For primary document see N83-13716 04-47)
(PB82-219767) Avail: NTIS HC A16/MF A01 CSCL 04B

The effect of the nonuniformity of the observational network on hemisphere means of surface air temperature, a quantity often used to monitor changes in the Earth's climate is evaluated. The nonuniformity is mainly a result of the act that long records of reliable surface air temperature measurements are mostly found over continents. Evaluation of the effect of the nonuniformity of the observational network is attempted by using the surface air temperature record of a 15 year integration of an atmospheric general circulation model (AGCM), a data set for which exact hemispheric means of surface air temperature can be easily obtained. The AGCM is a highly truncated spectral model which is very similar to the spectral model in which 15 zonal and meridional wave numbers (R15) are retained. This spectral AGCM has a global domain, incorporates realistic geography and topography, and seasonally varying observed distributions of sea surface temperature and insolation. S.L.

N83-13746# Texas A&M Univ., College Station. Dept. of Meteorology.
CLIMATIC STATION HISTORY, FACT AND FICTION (OR WHERE WAS FIRST BASE?)
John F. Griffiths *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 236-240 (For primary document see N83-13716 04-47)
(PB82-219775) Avail: NTIS HC A16/MF A01 CSCL 04B

Errors existing in weather data due to instrument errors, observer errors, statistical errors, and changes in station location or station surroundings are surveyed, with concentration on the reliability of station histories. The homogeneity of temperature and precipitation data from a given weather station is considered, based on 80 years of records from 10 first order stations in the U.S. J.D.

N83-13747# National Meteorological Center, Washington, D.C.
THE STATUS AND FUTURE OF THE CLIMATE DIAGNOSTICS DATA BASE
Phillip A. Arkin *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 241-246 refs (For primary document see N83-13716 04-47)
(PB82-219783) Avail: NTIS HC A16/MF A01 CSCL 04B

One of the missions of the Diagnostics Branch of the Climate Analysis Center is to assess the current state of the total atmospheric/oceanic/cryospheric climate system in a prompt fashion. Substantial portions of the data required to produce such

an assessment have not, in the past, been available soon enough to permit its timely production. The Climate Diagnostics Data Base (CDDB) is an attempt to provide all the data required for such an assessment so that it may be completed promptly following the end of the period. The original data from which the components of the CDDB are derived are processed by the National Meteorological Center (NMC) and the National Environmental Satellite Service (NESS). The CDDB can thus be conveniently divided into CDDB/NMC and CDDB/NESS portions. The products in the former come largely from the NMC FINAL optimum interpolation analysis, while those in the latter come from a variety of sources, including both polar orbiting and geosynchroneous satellites. Author

N83-13748*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CONTRIBUTION OF WIDE RANGE OF SPACE AND TIME SCALES TO THE NORTHWARD FLUX OF WESTERLY MOMENTUM
David M. Straus *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 247-254 refs (For primary document see N83-13716 04-47)
(PB82-219791) Avail: NTIS HC A16/MF A01 CSCL 04B

The contribution of a wide range of time scales to the long time average of atmospheric variances and covariances, and in particular on the contribution of the annual cycle is discussed. The interannual variability of seasonally averaged fluxes is analyzed in the same context. For definiteness, numerical results will be shown for the eddy momentum flux at 200 mb as obtained from seven years of NMC analyses (March 8, 1970 - March 10, 1977). The role of the seasonal cycle is considered. J.D.

N83-13749# National Meteorological Center, Washington, D.C.
RELATIONSHIP BETWEEN SATELLITE MEASURED NET RADIATION AND ATMOSPHERIC ENERGETIC CYCLE
A. J. Miller and A. Gruber *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 255-260 refs (For primary document see N83-13716 04-47)
(PB82-219809) Avail: NTIS HC A16/MF A01 CSCL 04B

In diagnosing the large scale general circulation, the ultimate source of the atmosphere's energy, the solar and terrestrial radiation are considered. Within the classical formulation of the general circulation, the computational relationship of the diabatic heating to the atmosphere is quite complex and cannot be directly measured. Atmospheric net radiation measurements, absorbed minus emitted flux that were computed daily via the NOAA Polar orbiting satellites are used. In order to relate the net radiation to the general circulation, the daily net radiation data are averaged every 2.5 deg latitude from the North Pole to the equator. The poleward gradient over 2.5 deg latitude is determined and the gradient over the hemisphere (weighting the values by the cosine of the latitude) is averaged. The daily values of average net radiation gradient are then compared with values of the zonal available potential energy (AZ) computed daily (OOGMT) from the NMC analysis series; 1000-100 mb. S.L.

N83-13750# Maryland Univ., College Park. Dept. of Meteorology.
SPATIAL AND TEMPORAL VARIATIONS OF LARGE-SCALE SUBSIDENCE AND CONVECTION REGIONS DERIVED FROM SATELLITE DATA
Anandu D. Vernekar *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 261-267 refs (For primary document see N83-13716 04-47)
(Grants NA80AA-D-00035; NSF ATM-80-24881)
(PB82-219817) Avail: NTIS HC A16/MF A01 CSCL 04B

Geographical location and horizontal extent of large scale monthly mean subsidence regions and those of convection regions vary during a year and also vary from year to year. Anomalies in variations of subsidence regions over oceans can create anomalies in sea surface temperature and over land they can produce drought conditions. On the other hand, anomalies in variations of convection regions can create anomalies in rainfall patterns and in latent heat released. The variability of these systems from satellite data is determined. The data utilized is net outgoing infrared radiation (IR) at the top of the atmosphere. These data were derived from measurements made on scanning radiometer aboard the NOAA operational satellite. The global distribution of IR fields were available twice daily (9:00 a.m. and 9:00 p.m. local time) for 45 months. S.L.

N83-13751# Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.
SENSITIVITY OF GCM-DIAGNOSED RADIATIVE FLUXES TO OBSERVED MONTHLY MEAN DISTRIBUTIONS OF CLOUDINESS
C. T. Gordon and W. F. Stern *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 268-278 refs (For primary document see N83-13716 04-47)
(PB82-219825) Avail: NTIS HC A16/MF A01 CSCL 04B

Four quasi-global analyses of monthly mean low, middle, and high cloudiness are reconstructed or generated, and compared. Then, the sensitivity of model diagnosed radiative fluxes to these analyzed cloudiness fields is evaluated. The radiative fluxes are diagnosed by the radiation submodel of a moderate resolution spectral general circulation model from observed monthly mean meteorological conditions. A cloud analysis scheme, SATCLD, was developed, which constrains the cloudiness to be radiatively consistent with satellite derived fluxes. S.L.

N83-13752# National Meteorological Center, Washington, D.C.
STATISTICAL FIELD SIGNIFICANCE AND ITS DETERMINATION BY MONTE CARLO TECHNIQUES
R. E. Livezey and W. Y. Chen *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 279-284 refs (For primary document see N83-13716 04-47)
(PB82-219833) Avail: NTIS HC A16/MF A01 CSCL 04B

The overall statistical significance of a set of individual significance tests as encountered in diagnostic studies of short term climatic fluctuations is assessed. A two step test procedure is proposed to assess the significance of a finite collection of interdependent significance test results. Finiteness is first taken into account by computing the binomial odds of the experimental result. If they are smaller than a present criterion, estimates of effective degrees of freedom must be compared to the minimum required by the binomial distribution. If these are of the same order of magnitude a Monte Carlo simulation must be performed to finally ascertain significance. A survey of the recent literature revealed widespread applicability of the tests. J.D.

N83-13753# European Centre for Medium-Range Weather Forecasts, Reading (England).
ENERGY CALCULATIONS AT ECMWF
K. Arpe and E. Oriol *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 285-291 refs (For primary document see N83-13716 04-47)
(PB82-219841) Avail: NTIS HC A16/MF A01 CSCL 04B

Several forms of energy budget studies are compared with the operational initialized analysis method. The largest relative difference is found in the conversion of zonal available potential to zonal kinetic energy. The global average energy cycles as determined from the analyses are compared with five selected forecast periods for January 1981. Changes were observed in the day 1/2 forecasts in the conversion between zonal available potential and zonal kinetic energy, and consequently in the generation and dissipation of zonal energies. Further changes from day 2 to day 5 or 10 were observed. J.D.

N83-13754# Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.
THREE CASES OF ONE-MONTH GCM FORECASTS
R. Caverly, K. Miyakoda, and L. Umscheid *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 292-299 refs (For primary document see N83-13716 04-47)
(PB82-219858) Avail: NTIS HC A16/MF A01 CSCL 04B

Progress in the evaluation of the predictive ability of a finite

difference E physics global climate model (GCM) is reported. Use of the finite difference and a spectral GCM to produce several 30 day forecasts in conjunction with two subgrid scale parameterization schemes (the A and the E physics schemes) is summarized. The finite difference E physics GCM, which uses the Mellor-Yamada second order turbulent closure scheme and the Monin-Obukhov formulation of the constant flux layer, gave the best forecasts when compared with three other analyses. Progress in the evaluation of the finite difference E physics GCM by initializing each integration against nine one month integrations derived from other sources using first, climatological forcing, and then anomalous forcing, are reported. J.D.

N83-13755# Lamont-Doherty Geological Observatory, Palisades, N. Y.

MONTHLY CLIMATE PREDICTIONS FOR 1980 - 1981 WITH A THERMODYNAMIC MODEL INCORPORATING PARAMTERIZED DYNAMICS

Julian Adem, William L. Donn, and Richard Goldberg *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 300-310 refs Prepared in cooperation with Universidad Nacional Autonoma de Mexico, Mexico City (For primary document see N83-13716 04-47)

(PB82-219866) Avail: NTIS HC A16/MF A01 CSCL 04B

Quasi-operational monthly predictions of the anomalies of surface temperature using the thermodynamic model of Adem are described. The variables used to initialize prediction computations are: (1) the ocean surface temperature in the previous month, (2) the 700 mb temperature in the previous month, and (3) the albedo based on snow and ice distribution the last week of the previous month. The surface ocean and 700 mb temperatures prepared by the National Meteorological Center and the snow and ice data prepared by NESS-NOAA are used. From these data, normal maps of albedo adequate for use in the model are prepared. The integration is performed over the Northern Hemisphere with the use of the basic NMC grid abridged to 512 grid points. Results are given for the contiguous United States. J.D.

N83-13756# Lamont-Doherty Geological Observatory, Palisades, N. Y.

THE THERMODYNAMIC MODEL: SENSITIVITY TO INPUT DATA

William L. Donn and Richard A. Goldberg *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 311-315 refs (For primary document see N83-13716 04-47)

(Grant NA79AA-D-00066)

(PB82-219874; Contrib-3247) Avail: NTIS HC A16/MF A01 CSCL 04B

Numerical experiments to determine the sensitivity of the Adem thermodynamic model for production of monthly forecasts of climate to the data of the input variables as regards predictions for the contiguous United States are described. The months of June 1980, January 1981, and March 1981 were considered. Each forecast was run four times. First the full prediction was generated, then the contributions of each variable was determined separately, by substituting the climatological normals for the two not being tested. This procedure effectively reduces the input anomalies to zero. J.D.

N83-13757# Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.

AN ANOMALY MODEL AND ITS APPLICATION TO LONG-RANGE FORECASTS

J. P. Chao (Academia Sinica, Peking) and R. Caverly *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 316-319 refs (For primary document see N83-13716 04-47)

(PB82-219882) Avail: NTIS HC A16/MF A01 CSCL 04B

The anomaly model system is free of climatological model bias which makes advantageous over the total field model. The climatological component removed from the total field equations by dividing all the system variables into their climatological and anomalous components which result in the separation of the total field equation into the interdependent climatological and anomalous system. This procedure is used to remove the turbulent component from the time mean flow. The time evolution of the anomaly rather than the mean or climatological flow are important. The time dependent anomalous system is discussed. E.A.K.

N83-13758# Scripps Institution of Oceanography, La Jolla, Calif.

RELATIONSHIPS BETWEEN NORTH PACIFIC SST GRADIENTS AND UNITED STATES TEMPERATURE AND PRECIPITATION PATTERNS

Arthur V. Douglas *In* National Weather Service Proc. of the 6th Ann. climate Diagn. Workshop Mar. 1982 p 320-331 refs (For primary document see N83-13716 04-47)

(PB82-219890) Avail: NTIS HC A16/MF A01 CSCL 04B

The seasonal relationships between United States air temperatures and North Pacific SSTs were analyzed. These relationships were evaluated on a monthly rather than a seasonal basis. Precipitation data are included. The three data sets cover the period 1947-78. Station data are used to characterize air temperatures and divisional data are used for the precipitation analysis. Eigenvectors of the continental data sets were created. The time coefficients of the eigenvectors were subsequently cross correlated with gridded values of North Pacific SST's. Seasonal means of the SST data were used to stress persistent oceanic regimes, rather than short term or transitory anomalies which often appear in monthly data sets. E.A.K.

N83-13759# Maryland Univ., College Park. Dept. of Meteorology.

OBJECTIVE SPECIFICATIONS OF MONTHLY MEAN SURFACE TEMPERATURES IN THE CONTIGUOUS UNITED STATES FROM 700-mb MEAN HEIGHTS OVER NORTH AMERICA AND ADJACENT OCEANS DURING WINTER

William H. Klein *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 320-331 refs (For primary document see N83-13716 04-47)

(PB82-219908) Avail: NTIS HC A16/MF A01 CSCL 04B

Multiple regression equations derived 20 years ago from 5 day mean data are used to help prepare 30 day outlooks. These equations specify surface temperature anomalies at 39 stations from concurrent 700 mb height anomalies at a few grid points selected from a network of 70 points 10 deg apart, extending from 30 to 70 deg N and 50 to 180 W. The old equations are updated by rederiving from monthly mean data for a longer time period, larger number of cities, finer grid of heights, and larger domain. On the basis of 91 winter months (Dec., Jan., and Feb.) from 1947 to 1977. It is shown how synoptic climatology varies with region and how improved equations can be developed. Results on independent data consisting of 11 months from Jan. 1978 to Feb. 1981 are discussed. E.A.K.

N83-13760# Solar Climatic Research Inst., Cambridge, Mass.

TELECONNECTION STUDY: DOMINANT MODES OF RELATIONSHIP BETWEEN A TARGET FIELD AND 12 PREVIOUS MONTHS OF NH 500-mb HEIGHT

J. T. Prohaska and H. C. Willet *In* National Weather Service Proc. of the 6th Ann. Climate Diagn. Workshop Mar. 1982 p 340-341 refs (For primary document see N83-13716 04-47)

(PB82-219916) Avail: NTIS HC A16/MF A01 CSCL 04B

The sequences of relationship between the dominant modes of a target field and the corresponding predictor field patterns for the previous 12 months were examined. The use of the term teleconnections is broadened to include the relationship between two fields of the same or different quantities and geographic areas. The dominant modes of relationship are the principal components obtained by the eigenanalysis of the field of linear cross correlations between the elements of the target and predictor fields. E.A.K.

N83-13761# Wisconsin Univ., Madison. Dept. of Meteorology.

DIAGNOSTICS OF CLIMATE ANOMALIES IN TROPICAL BRAZIL Final Report. Ph.D. Thesis

Pau Shin Chu Apr. 1982 162 p refs

(Grants NA79AA-D-00131; NSF ATM-79-11131)
(PB82-229162; NOAA-82052405) Avail: NTIS HC A08/MF A01 CSCL 04B

The large-scale atmospheric circulation of the Brazil-Atlantic sector is studied in relation to extreme climatic anomalies in three large regions of tropical Brazil. Departure patterns of meteorological elements over the Atlantic are investigated for composites of extremely dry and wet years in each region. Departure characteristics are tested for statistical significance. Southern Nordeste's peak rainy season is around Nov/Dec and is associated with Southern frontal systems. Case studies of individual extreme years document the prevalence of divergence/convergence during the dry/wet years. Northern Nordeste receives its maximum rainfall in March/April. Rainfall variations are modulated by the latitudinal displacement of the baric trough and confluence axis over the equatorial Atlantic, and concomitant sea surface temperature anomalies.
Author (GRA)

N83-13762# National Oceanic and Atmospheric Administration, Washington, D. C.
PUBLICATIONS AND FINAL REPORT ON CONTRACTS AND GRANTS, 1981
Nancy A. Everson, comp. Apr. 1982 19 p
(PB82-229204; NOAA-TM-NESS-117; NOAA-82051103) Avail: NTIS HC A02/MF A01 CSCL 04B

This technical memorandum is one of a series containing lists of articles and reports published by or for the National Earth Satellite Service (NESS). This issue lists items published or received during 1981 and includes items omitted from the previous issue.
Author (GRA)

N83-13763# National Oceanic and Atmospheric Administration, Rockville, Md.
NUMERICAL WEATHER PREDICTION Activities Report, 1981
Apr. 1982 49 p refs
(PB82-230392; NOAA-82051007) Avail: NTIS HC A03/MF A01 CSCL 04B

A more efficient version of the Limited Area fine-meshed Model 2 computer program was implemented operationally on 11 June 1981. A complete Global Spectral system to produce 144 hour forecasts from the 0000 GMT cycle was implemented operationally on 18 March 1981. Coefficient fields from Nested Grid Model's Spectral Model now enable the Movable Fine-Mesh Model to run anywhere on the globe. Color graphics dislays were developed to aid meteorologists in the interpretaton of computer-generated weather radar products. A new automated convective outlook based on Model Ouput Statistics probability forecasts of thunderstorms and severe local storms was operationally implemented and found to provide a skill level comparable to conventional manually-prepared guidance. Solar energy forecast guidance was produced for the first time for stations throughout the United States.
GRA

N83-13764# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A PROTOTYPE LASER WEATHER IDENTIFIER
Ting-i Wang, G. R. Ochs, W. D. Cartwright, B. W. Guderian, and S. Y. Simpson Jan. 1982 20 p refs
(PB82-230418; NOAA-TM-ERL-WPL-95; NOAA-82052413) Avail: NTIS HC A02/MF A01 CSCL 04B

The optical, mechanical, and the electronic systems of a prototype Laser Weather Identifier (LWI) are described. It was suggested that optical identification may provide a practical technique for unmanned automatic monitoring of weather conditions. A prototype operational instrument was built by the Wave Propagation Laboratory in Boulder, Colorado. The detailed construction of the instrument, including a transmitter, a reciever, and a data processor is discussed in this report.
GRA

N83-13765# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Weather Research and Modification.
RADAR ECHO POPULATIONS IN THE PROPOSED CDMP EXPERIMENTAL AREA
Jeffrey H. Morris and Ronald L. Holle Feb. 1982 29 p refs
(PB82-230434; NOAA-TM-ERL-OWRM-15; NOAA-82052411) Avail: NTIS HC A03/MF A01 CSCL 04B

The Miami WSR-57 radar was used to study characteristics of echoes that formed inside the experimental area in south Florida proposed for the Cumulus Dynamics and Microphysics Program (CDMP). A variety of characteristics of echoes at level 2 or greater was determined for the planned program period between June 15 and August 15 with radar film from 1973, 1975 and 1980. Nearly every day had at least one echo that formed in this area; the average was 8.8 echoes per day. If seeding were performed during the project, and a change in treatment decision were allowed within a day on clouds that formed in the area 60 min after a previous cloud reached maturity on radar, about half the days could have at least one change in treatment. For a 30 min period between clouds most days could have one or more reverse decisions.
Author (GRA)

N83-13766# National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology.
INTERDURATION PRECIPITATION RELATIONS FOR STORMS: WESTERN UNITED STATES
Ralph H. Frederick, John F. Miller, Francis P. Richards, and Richard W. Schwerdt Sep. 1981 168 p refs Sponsored in part by Dept. of Agriculture
(PB82-230517; NOAA-TR-NWS-27; NOAA-82052801) Avail: NTIS HC A08/MF A01 CSCL 04B

Annual maximum precipitation events for durations of N = 1, 2, 3, 6, 12, and 24 hours are identified. The largest precipitation amounts for durations of M = 1, 2, 3, 6, 12, and 24 hours concurrent with the N-hr event are then selected. The events are stratified according to magnitude (quartiles) and relations between the N-hr and M-hr event are studied by forming a ratio of shorter to longer duration precipitation totals. Accumulated probabilities of this ratio are suggested as a tool to estimate precipitation increments necessary in the synthesis of precipitation mass curves.
Author (GRA)

N83-13767*# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
VALIDATION AND APPLICATION OF THE SEASAT-SMMR GEOPHYSICAL ALGORITHMS Final Report
Kristina B. Katsaros and Lynn A. McMurdie Feb. 1982 96 p refs Sponsored in part by NASA
(Contract NA78-SAC-04102)
(NASA-CR-169390; NAS 1.26:169390; PB82-237934; Contrib-616; NOAA-82051012) Avail: NTIS HC A05/MF A01 CSCL 04B

The work was concentrated on verification of the atmospheric water channels on SEASAT's Scanning Multichannel Microwave Radiometer (SMMR). Data from the Gulf of Alaska Experiment (GOASEX), tropical island stations, and particularly from the Joint Air Sea Interaction (JASIN) experiment have been used to compare with the SMMR algorithm predictions. SMMR's water vapor has been found to be at least as accurate as conventional radiosondes. Liquid water and rain rate have insufficient comparisons for statistical results, but can be said to show promise in a qualitative sense. The SEASAT SMMR maps of the atmospheric water components were found to be very useful in helping to locate fronts and cloudy and rainy areas in the JASIN experiment.
Author (GRA)

N83-13768# Illinois State Water Survey, Champaign.
CAUSES AND IMPLICATIONS OF RECORD WINDBLOWN DUST CONDITIONS DURING 1981 IN ILLINOIS
Stanley A. Changnon, Jr. 1982 28 p refs
(PB82-216540; ISWS/CIR-151/82) Avail: NTIS HC A03/MF A01 CSCL 04B

An analysis was made of the severe and frequent dust storms experienced in eastern and central Illinois during the spring of 1981. Results are presented in this report showing (1) placement of the 1981 dust conditions in a historical perspective; (2) weather factors - precipitation, soil moisture, wind, and temperature conditions - related to the severe dust conditions; and (3) the role

played by soils and farm practices in the blowing dust conditions. GRA

N83-13769# National Center for Atmospheric Research, Boulder, Colo.
STRATOSPHERIC CIRCULATION STATISTICS
Kevin Hamilton Mar. 1982 182 p refs
(Grant NSF ATM-77-23757)
(PB82-225574; NCAR/TN-191) Avail: NTIS HC A09/MF A01 CSCL 04B

Tables and diagrams are presented which describe the monthly mean statistics of the circulation in the Northern Hemisphere stratosphere from July 1976 through April 1980, as revealed by NMC operational analyses. Results for the zonal mean temperature, geostrophic zonal wind, and the eddy heat and momentum transports associated with the geostrophic wind are included. GRA

N83-13770# National Center for Atmospheric Research, Boulder, Colo.
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH Annual Report, 1981
Mar. 1982 80 p refs
(Contract NSF ATM-77-23757)
(PB82-225616; NCAR/ar-81) Avail: NTIS HC A05/MF A01 CSCL 04B

Ongoing research activities and the most significant recent achievements of the National Center for Atmospheric Research are described. A nontechnical introduction puts the Center's effort in the broader context of atmospheric research in general and gives an overview of its programs. Storms, weather forecasting, data processing, and aeronomy are discussed. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-13771*# Woods Hole Oceanographic Institution, Mass. Dept. of Physical Oceanography.
DESCRIPTION AND EVALUATION OF THE ACOUSTIC PROFILING OF OCEAN CURRENTS (APOC) SYSTEM USED ON R. V. OCEANUS CRUISE 96 ON 11-22 MAY 1981
Terrence M. Joyce, S. R. Rintoul, Jr., and R. L. Barbour Nov. 1982 53 p refs
(Grant NAG1-91)
(NASA-CR-169529; NAS 1.26:169529; WHOI-82-48) Avail: NTIS HC A04/MF A01 CSCL 08C

The underway current profiling system which consists of a microprocessor controlled data logger that collects and formats data from a four beam Ametek-Straza 300 kHz acoustic Doppler current profiler, heading from the ship's gyrocompass, and navigation information from a Loran-C receiver and a satellite navigation unit is discussed. Data are recorded on magnetic tape and real time is calculated. Time averaging is required to remove effects of ship motion. An intercomparison is made with a moored vector measuring current meter (VMCM). The mean difference in hourly averaged APOC and VMCM currents over the four hour intercomparison is a few mm s minus including: two Gulf Stream crossings, a warm core ring survey, and shallow water in a frontal zone to the east of Nantucket Shoals. E.A.K.

N83-13772*# Bionetics Corp., Hampton, Va.
A METHOD FOR THE EXTRACTION AND QUANTITATION OF PHYCOERYTHRIN FROM ALGAE
Dianne E. Stewart Oct. 1982 13 p refs
(Contract NAS1-16978)
(NASA-CR-165996; NAS 1.26:165996) Avail: NTIS HC A02/MF A01 CSCL 08A

A summary of a new technique for the extraction and quantitation of phycoerythrin (PHE) from algal samples is described. Results of analysis of four extracts representing three PHE types from algae including cryptomonad and cyanophyte types are presented. The method of extraction and an equation for quantitation are given. A graph showing the relationship of concentration and fluorescence units that may be used with samples fluorescing around 575-580 nm (probably dominated by cryptophytes in estuarine waters) and 560 nm (dominated by cyanophytes characteristics of the open ocean) is provided. Author

N83-13773*# City Univ. Inst. of Marine and Atmospheric Sciences, New York.
THE MEASUREMENT OF THE SYNOPTIC SCALE WIND OVER THE OCEAN Technical Report, 1981 - 1982
Willard J. Pierson Dec. 1982 81 p refs
(Contract NAS1-15669; Grant NAGw-266)
Avail: NTIS HC A05/MF A01 CSCL 08C

Mesoscale and microscale features of the turbulent winds over the ocean are related to the synoptic scale winds in terms of published spectral forms for the microscale, a mesoscale valley and published values of U*, VAR u', VAR v' and z/L, as defined in the text and as obtained for moderate to gale force winds. The frequencies involved correspond to periods longer than 1 hour and extend to the microscale, which starts at a period near 2 minutes, or so, and continues to the Kolmogorov inertial range. Nondimensional spectra that span both the mesoscale and the microscale are derived as a function of u, f(= n z/u) and z/L, where z is 10 meters, L is the Monin Obukov stability length and u is evaluated at 10 meters. For the same u, different values of z/L produce a range of values of u which in turn result in variations of the eddy structure of the mesoscale and microscale spectra. Both conventional anemometer averages and remotely sensed winds contain a random component of the mesoscale wind in their values. These components are differnces and not errors when winds are compared, and quantitative values for these differences are given. Ways to improve the measurement of the synoptic scale wind by transient ships, data buoys and scatterometers on future spacecraft are described. These ways are loner averaging times for ships and data buoys, depending on the synoptic conditions, and pooling spacecraft to form super observations. Design considerations for future remote sensing systems are given. Author

N83-13774# Wasser- und Schiefahrtsamt Bremerhaven (West Germany).
WAVE MOTION IN AN ESTUARY Final Report, Sep. 1981
Volker Barthel Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 299 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-M-82-001; ISSN-0340-8868) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 46

Wave climate in an estuary with a strongly changing topography was investigated. Wave effects on coastal engineering works, on morphology and on the vertical movements of large ships by long-period waves were measured by wave-rider buoys and wave gages. Data were analyzed for significant wave parameters and by spectral analysis. The results show the dependence of wave height and period on wind velocity and direction as well as on water depth. Long-period waves and maximum wave heights up to 15 m can occur. The spectral analysis shows that the loss of energy with respect to heights in a reef region is smaller than expected and that the main transformation of energy can be detected in front of the Wadden Sea. Only 20% of incoming energy reaches the interior estuary. Author (ESA)

N83-13775*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
EXPLOITATION OF SAR DATA FOR MEASUREMENT OF OCEAN CURRENTS AND WAVE VELOCITIES Final Report, 15 Aug. 1978 - 1 Sep. 1981
R. A. Shuchman, D. R. Lyzenga, and A. Klooster, Jr. Sep. 1981 123 p refs Sponsored in part by NASA
(Contract MO-A01-78-00-4322)
(NASA-CR-169618; NAS 1.26:169618; PB82-229220;

ERIM-137600; NOAA-82051013) Avail: NTIS HC A06/MF A01 CSCL 08C

Methods of extracting information on ocean currents and wave orbital velocities from SAR data by an analysis of the Doppler frequency content of the data are discussed. The theory and data analysis methods are discussed, and results are presented for both aircraft and satellite (SEASAT) data sets. A method of measuring the phase velocity of a gravity wave field is also described. This method uses the shift in position of the wave crests on two images generated from the same data set using two separate Doppler bands. Results of the current measurements are pesented for 11 aircraft data sets and 4 SEASAT data sets. GRA

N83-13776*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.

FURTHER SEASAT SAR COASTAL OCEAN WAVE ANALYSIS Final Report, Mar. 1980 - Sep. 1981

E. S. Kasischke, R. A. Shuchman, G. A. Meadows, P. L. Jackson, and Y. Tseng Sep. 1981 207 p refs Sponsored in part by NASA

(Contract MO-A01-78-00-4339)

(NASA-CR-169682; NAS 1.26:169682; PB82-230350; ERIM-138600-6-F; NOAA-82052402) Avail: NTIS HC A09/MF A01 CSCL 08C

Analysis techniques used to exploit SEASAT synthetic aperture radar (SAR) data of gravity waves are discussed and the SEASAT SAR's ability to monitor large scale variations in gravity wave fields in both deep and shallow water is evaluated. The SAR analysis techniques investigated included motion compensation adjustments and the semicausal model for spectral analysis of SAR wave data. It was determined that spectra generated from fast Fourier transform analysis (FFT) of SAR wave data were not significantly altered when either range telerotation adjustments or azimuth focus shifts were used during processing of the SAR signal histories, indicating that SEASAT imagery of gravity waves is not significantly improved or degraded by motion compensation adjustments. Evaluation of the semicausal (SC) model using SEASAT SAR data from Rev. 974 indicates that the SC spectral estimates were not significantly better than the FFT results. GRA

N83-13777# Oregon State Univ., Corvallis. Sea Grant College Program

NEARSHORE WAVE CLIMATOLOGY YAQUINA BAY, OREGON, 1971 - 1981

Clayton Creech 1981 66 p refs

(Grant NA79AA-D-00106)

(PB82-233792; ORESU-T-81-002; NOAA-82060305) Avail: NTIS HC A04/MF A01 CSCL 08C

The nearshore wave climatology off Yaquina Bay (Newport), Oregon is described for the period October 1971 to March 1981. The wave measurement system, calibration procedures, and data reduction techniques employed are described. Resulting data are presented as tables and diagrams. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-13778 Defence Research Information Centre, Orpington (England).

INVESTIGATIONS ON THE METHOD OF LONG TERM PRESERVATION OF LIVING BLOOD CELLS BY FREEZING Ph.D. Thesis - Tech. Hochschule, Aachen

M. W. Scheiwe Aug. 1982 147 p refs Transl. into ENGLISH of 'Untersuch. zum verfahren der langzeitkonservierung lebender blutzellen durch gefrieren' (Aachen)

(DRIC-T-6438; BR84551) Copyright. Avail: Issuing Activity

The processes in the freezing and thawing of the components of blood are discussed, and a thermodynamic model of the processes in freezing is presented. A cryomicroscope for the analysis of dynamic processes in freezing is described. The determination of water loss from erythrocytes and leukocytes, and intercellular crystallization temperatures were studied. The influence of hydroxyethyl starch on the cryopreservation of erythrocytes was considered and the systematic aspects of the crystallization of the solutions were investigated. Author (ESA)

N83-13779 Defence Research Information Centre, Orpington (England).

LUMINESCENCE SPECTRA OF SEA ULTRANANOPLANKTONIC 'OLIVE GREEN' CELLS

T. F. Narusevich, P. P. Martsenyuk, and V. N. Karnaukhov Jul. 1982 9 p refs Transl. into ENGLISH from Biol. Morya (Kiev), v. 51, 1979 p 52-55

(DRIC-T-6616; BR84268) Copyright. Avail: Issuing Activity

Changes in the luminescence spectra of single olive green cells in the normal state and as affected by formalin, and 365 and 436 nm radiation were examined. The presence of compounds luminescent in the regions 687 to 690 and 530 to 550 nm was demonstrated. The spectra of live olive green cells show no evidence of the presence of phycobilin pigments. It is suggested that the olive green cells are not related to fungal spores nor to blue-green or red algae. Author (ESA)

N83-13780 Defence Research Information Centre, Orpington (England).

LUMINESCENCE OF NOCTILUCA MILIARIS AND THE CHARACTERISTICS OF ITS EXCITABILITY

E. P. Bityukov Aug. 1982 11 p refs Transl. into ENGLISH from Zhurnal Evolutsionnoi Biokhimi i Fiziol. (USSR), v. 2, no. 5, 1966 p 452-456

(DRIC-T-6728; BR84553) Copyright. Avail: Issuing Activity

The excitability of the bioluminescence of the dinoflagellate noctiluca miliaris was characterized quantitatively by photometry of light of low intensity, when the organism was electrically stimulated to flashing. No species specific light response is reported. The magnitude of the light response is directly related to the magnitude of the exciting current. Chronaxie values suggest that noctiluca should be classed as rapid if Lapicque's terminology is used. Author (ESA)

N83-13781 Defence Research Information Centre, Orpington (England).

BIOLUMINESCENCE AS A HYDROOPTICAL AND BIOLOGICAL FACTOR IN THE OCEAN

I. I. Gitelzon, O. G. Baklanov, V. S. Filimonov, A. S. Artemkin, and V. F. Shatokhin Jul. 1982 17 p refs Transl. into ENGLISH from Trudy Moskovskogo Obshchestva Ispytatelei Prirody, (USSR), v. 21, 1965 p 147-155

(DRIC-T-6729; BR84270) Copyright. Avail: Issuing Activity

Bathyphotometric investigations of regions of the Pacific and Indian Oceans are described. Bioluminescence was measured to a depth of 2000 m, using a specially designed instrument. Bioluminescence is found to vary in intensity and form depending on depth, time of day, quantity and species composition of bioluminescent organisms. Author (ESA)

N83-13782# New South Wales Univ., Kensington (Australia). Centre for Biomedical Engineering.

ELECTRORETINOGRAPHY M.S. Thesis

Karl S. Kruszelnicki 1981 208 p refs

Avail: NTIS HC A10/MF A01

The electroretinogram (E.R.G.) is a low level electrical signal that is generated by the retina in response to stimulation by light. The apparatus that records E.R.G.s for diagnostic purposes is described. The function of the rod cells of the retina is evoked dark adaptation. Both visual electrophysiology and dark adaptation are discussed. Various specialized devices were manufactured to test dark adaptation, and to enable the operator/s to work in the dark without destroying their own dark adaptation, and details of their construction and testing are given. Cone function was tested in subjects following exposure to light intensities normal for the working environment. S.L.

N83-13783# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 16, NO. 5, SEPTEMBER - OCTOBER 1982
9 Nov. 1982 154 p refs Transl. into ENGLISH of Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 96 p
(JPRS-82194) Avail: NTIS HC A08

Articles on the effects of space flight stress and on man and animals and other aspects of aerospace medicine are presented. For individual titles, see N83-13784 through N83-13805.

N83-13784# Joint Publications Research Service, Arlington, Va.
PREFLIGHT DIET FOR FLIGHT PERSONNEL **c54**
I. G. Popov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 1-20 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 4-17 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

The evolution of the concepts of preflight diets of flight personnel in the USSR and in other countries is discussed from the historical point of view. The main stages in the evolution associated with changes in the physiological-hygienic requirements for the diets and increases in the flight altitude, range, and speed are described. The data on the arrangement of preflight meals, their composition, and nutrient parameters are given. Physiological-hygienic requirements for preflight diets of flight personnel are determined in the light of present-day concepts and their future developments are outlined. Author

N83-13785# Joint Publications Research Service, Arlington, Va.
STATIC ELECTRIC AND ELECTROMAGNETIC LOW-FREQUENCY FIELDS (BIOLOGICAL EFFECTS AND HYGIENIC ASSESSMENT) **c52**
B. I. Davydov and V. N. Karpov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 21-30 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 18-23 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

The literature data are used to analyze the hygienic situation when man is exposed to constant electrical and low frequency electromagnetic radiations. The spectral characteristics and intensities of electrical fields near and on the surface of the earth generated by natural sources of electromagnetic radiations (electrical quasi-static fields, atmospheric electricity, thunderstorm charges, electromagnetic radiation emitted by the Sun and galaxies) are given. They can be employed to determine man's adaptive capabilities to the frequencies described during acute and chronic irradiation. The mechanisms of biological effects of the exposures are discussed. The methods for calculating the safety levels based on the USSR radiation safety standards and the "competing frequencies" procedure proposed can be applied to the design of electrotechnical devices and evaluation of integral hazard of constant electrical and electromagnetic fields of low frequencies. Author

N83-13786# Joint Publications Research Service, Arlington, Va.
POSSIBLE USE OF ULTRASONIC BIOLOGICAL ECHOLOCATION AS A NONINVASIVE METHOD OF EVALUATING INTRACRANIAL VOLUMES IN MAN **c52**
L. G. Simonov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 31-38 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 24-28 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

Potential applications of the method of ultrasonic echolocation for determining intracranial fluid volume relations are discussed. The data presented give evidence that variations in the attenuation coefficient and propagation pattern of the ultrasonic signal may reflect changes in both hemodynamics and intracranial pressure. Simultaneous invasive investigations may help quantify ultrasonic echolocation results. The review shows that ultrasonic echolocation of the brain can be used to determine variations in the intracranial volume relations induced by simulated space flights and to make well documented diagnoses. Author

N83-13787# Joint Publications Research Service, Arlington, Va.
SAFETY CRITERION FOR PROTECTION OF PILOT'S HEAD AGAINST IMPACTS **c54**
A. S. Barer, Yu. G. Konakhevich, and L. N. Sholpo *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 39-45 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 29-33 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

In order to determine man's tolerance, clinical symptoms of craniocerebral injuries were compared with physical characteristics of impacts. A ranking scheme of clinical manifestations of craniocerebral injuries as applied to specific flight conditions was developed. With respect to the craniocerebral injury biomechanics, clinical data were examined statistically, which helped to evaluate impact-critical parameters and to propose a graphic scheme that can be used to describe in detail the accident and to estimate the probability of injuries of various degree over the entire range encountered in aviation and clinical practice. Author

N83-13788# Joint Publications Research Service, Arlington, Va.
BALLISTOCARDIOGRAPHIC STUDIES DURING FOURTH MISSION ABOARD SALYUT-6 ORBITAL STATION **c52**
R. M. Bayevskiy and I. I. Funtova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 46-51 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 34-37 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

This paper presents ballistocardiographic examinations of the Salyut-6 fourth expedition crew members who showed variations in both the shape and amplitude of ballistocardiographic complexes. Ballistocardiograms (BCG) were reported by means of a piezoelectric sensor which was attached to the upper part of the iliac bone, near the body mass center. During ballistocardiography the ballistic forces in the head-to-feet direction were recorded. The examinations were performed preflight and on missions days 46, 71, 98, 133 and 175. Hemodynamic specificities of the right and left heart were determined with the aid of the breath-holding test. Measurements of BCG amplitudes were used to determine the kinetic effect of heart rate. The largest amplitude of BCG waves was seen on mission day 133. At this time period the systolic wave amplitude decreased during inhalation holding. Author

N83-13789# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ASSESSMENT OF CIRCULATORY REACTION DURING WORK IN WEIGHTLESSNESS AND IN SALYUT STATION MOCKUP **c52**
V. G. Doroshev, N. A. Lapshina, Z. A. Kirillova, O. B. Kulikov, A. V. Kaliberdin, and S. I. Ponomarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 52-56 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), Vol. 16 no. 5, Sep. - Oct. 1982 p 38-40 (For primary document see N83-13783 04-51)
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Comparative evaluations of circulation responses of 22 operators and 13 cosmonauts to simulated and real flights onboard the Salyut station revealed significant differences. By the end of the flight cardiovascular responses of the operators showed signs of their increased conditioning, whereas the cosmonauts exhibited symptoms of circulation tension, which were particularly expressed during the first week and by the end of flight. Operator's activities in an orbital station mockup cannot be considered an adequate model for cardiovascular studies. Author

N83-13790# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF HUMAN EYE AND HEAD MOVEMENTS DURING GAZE

FIXATION REACTION **c52**

Yu. V. Kreydich, A. A. Repin, V. A. Barmin, and I. B. Kozlovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 57-63 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 40-44 (For primary document see N83-13783 04-51)

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The effect of 7-day immersion hypokinesia on the coordination of eye and head movements during the gaze fixation reaction was investigated. The most distinct and persistent effect was an inadequate increase in the rate of eye counter-rolling that mismatched head movements. This reduced significantly the response time and accuracy: the time of gaze fixation lengthened appreciably and the number of positional errors grew considerably. These data suggest that in the oculomotor control system proprioceptive signals produce an inhibitory effect on the vestibular input. Author

N83-13791# Joint Publications Research Service, Arlington, Va.
CENTRAL CIRCULATION IN HEALTHY MAN DURING 7-DAY HEAD-DOWN HYPOKINESIA **c52**

V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, V. V. Rumyantsev, T. M. Gueynova, and I. A. Yegorova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 64-72 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 45-51 (For primary document see N83-13783 04-51)

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The effect of 7-day head-down tilt (-15 deg) and lower body negative pressure on circulation and oxidative metabolism was investigated on 13 healthy male test subjects. For 7-10 days they had Swan-Ganz catheters implanted in the pulmonary artery and a special cannula in the radial artery. The most marked changes were seen in the pulmonary artery pressure (PAP) and central venous pressure (CVP) that varied in a phase-like manner. By the 7th hour of bed rest the PAP increased significantly; this was followed by increases in the total lung resistance and the right ventricle function, as well as by a slight decrease of renin and aldosterone. Beginning with bed rest days 2 or 3 the PAP and CVP declined and remained lowered, till the end of bed rest. The responses to LBNP tests changed by bed rest day 2. Possible mechanisms of the above changes are discussed. Author

N83-13792# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS OF CARDIOVASCULAR REACTIONS IN IMMEDIATE LBNP AFTEREFFECT PERIOD **c52**

L. Ya. Andriyako, V. G. Voloshin, and V. A. Degtyarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 73-77 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 51-54 (For primary document see N83-13783 04-51)

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Circulation variations during lower body negative pressure (LBNP) immediate aftereffects were investigated. Test subjects with different test tolerance showed dissimilar cardiovascular responses. The lack of reflect bradycardia in the test subjects with reduced LBNP tolerance gives evidence that their regulatory mechanisms are insufficiently reactive; this is manifested during the aftereffects of low LBNP (up to -40 mm Hg). Author

N83-13793# Joint Publications Research Service, Arlington, Va.
FEASIBILITY OF SIMULATING HEMODYNAMIC EFFECTS OF WEIGHTLESSNESS WITH USE OF POSITIVE PRESSURE **c52**

A. S. Nekhayev, V. A. Degtyarev, V. S. Bednenko, and Z. A. Kirillova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 78-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med., (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 54-57 (For primary document see N83-13783 04-51)

Avail: NTIS HC A08

Venous and arterial circulation was investigated by simulating cephalad blood shifts generated by an exposure of test subjects to lower body positive pressure (LBPP) and head-down tilts at -8 deg and -15 deg. At LBPP and tilt -15 deg arterial pressure increased by 5 to 15%. During tilt -8 deg jugular vein blood filling increased 8 to 94% in the course of the first 3 hrs and then decreased reaching the baseline (horizontal position) level. During LBPP the parameter changed in a similar manner (increased by 2 to 50%). During tilt -15 deg the parameter grew by 10 to 110% and remained elevated. The exposures gave rise to bradycardia which was more pronounced during -8 deg and LBPP. The data obtained give evidence that circulation changes during LBPP and head-down tilts are identical. This suggests that LBPP can be used to simulate the effect of cephalad blood shifts. Author

N83-13794# Joint Publications Research Service, Arlington, Va.
EVALUATION OF MAN'S PHYSICAL CONDITIONING ACCORDING TO ENERGETICALLY OPTIMUM WALKING SPEED **c52**

In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 82-85 refs Transl. into ENGLISH from Kosm. Biol. i Aviaosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 57-59 (For primary document see N83-13783 04-51)

Avail: NTIS HC A08

Methods for evaluating energy expenditures associated with terrain cure walking under the assumption of additivity of expenditures involved in walking along flat and rugged terrain are described. It is shown that people of different physical fitness have different values of energetically optimal walking speed. The concept of the energetically optimal speed allows quantitative estimations of movement associated energy expenditures, taking into account individual exercise tolerance. Author

N83-13795# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL CHANGES IN CANINE BLOOD PLASMA UNDER EFFECT OF REPEATED EXPOSURE TO ACCELERATIONS

R. A. Vartbaronov, G. D. Glod, Yu. P. Lanovenko, and N. N. Uglova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 86-89 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 60-61 (For primary document see N83-13783 04-51)

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Dogs were exposed for 3 months to +Gz acceleration applied three times a day for 3 days a week. Biochemical measurements showed the largest changes (decrease in total protein, increase in sugar, bilirubin, cholesterol, alkaline phosphatase and transaminases) after the first day of the repeated exposure to +Gz. Following 1 to 3 months of the exposure, the changes decreased significantly; however, the K+ concentration continued to decline and that of alkaline phosphatase continued to increase. It is indicated that the development of adaptation to repeated +Gz exposures differs from that to short term exposures. E.A.K.

N83-13796# Joint Publications Research Service, Arlington, Va.
REPRODUCTIVE FUNCTION IN MALE RATS AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE

L. V. Serova, L. A. Denisova, Z. I. Apanasenko, M. A. Kuznetsova, Ye. S. Meyzerov, and N. A. Chelnaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 90-95 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 62-65 (For primary document see N83-13783 04-51)

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Male rats which were flown for 18.5 days on Cosmos-1129 were mated postflight with intact females. The mating took place 5 days postflight, when the ejaculate consisted of spermatozoids that were exposed to zero-g effects in the mature stage, and yielded a litter which lagged behind the controls in growth and development during the first postnatal month. The mating which took place 2.5-3 months postflight, when the ejaculate consisted of spermatozoids that were exposed to zero-g effects at the stem

cell stage, yielded a litter which did not differ from the control. E.A.K.

N83-13797# Joint Publications Research Service, Arlington, Va.
EFFECT OF STRESS ON NUCLEIC ACID METABOLISM IN RAT SPLEEN AND LIVER FOLLOWING FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
G. S. Komolova, Ye. N. Troitskaya, I. A. Yegorov, and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 96-101 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 66-69 (For primary document see N83-13783 04-51)
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Changes in nucleic acid metabolism of the spleen and liver of rats flown for 18.5 days on Cosmos-1129 were investigated. Postflight changes in liver RNA synthesis after an additional stress effect (immobilization) were noted to a lesser degree in the rats than in the controls. The DNA synthesis remained essentially at the preflight level. The tissue content of nucleic acids suggests that postflight the dystrophic changes induced by the additional stress effect increased. It is suggested that an exposure to space flight contributes to the depletion of compensatory mechanisms maintaining the normal level of metabolic processes. E.A.K.

N83-13798# Joint Publications Research Service, Arlington, Va.
EFFECT OF EXCESSIVE PHOSPHORUS INTAKE ON SOME ASPECTS OF PHOSPHORUS-CALCIUM METABOLISM AND CONDITION OF BONE TISSUE IN HYPOKINETIC RATS
M. S. Belakoskiy, N. V. Blazheyevich, V. B. Spirichev, I. N. Sergeyev, and N. Ye. Spisyna *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 102-107 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 70-73 (For primary document see N83-13783 04-51)
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The exposure of rats fed with the diet containing Ca:P = 1:05-1:3 to hypokinesia produced by hypocalciemia, osteoporosis and increased renal calcinosis. The reduced phosphorus consumption prevented the disorders in the intact animals and increased bone density in the hypokinetic rats. The excessive phosphorus consumption caused hypocalciemia, hyperphosphatemia and slight osteoporosis in both intact and hypokinetic rats. It is concluded that the diet with Ca:P = 1:0.5-1:1 is optimal for hypokinetic rats. E.A.K.

N83-13799# Joint Publications Research Service, Arlington, Va.
ROLE OF 24,25-DIHYDROXYCHOLECALCIFEROL IN BONE MINERALIZATION IN HYPOKINETIC RATS **c52**
I. N. Sergeyev, N. V. Blazheyevich, M. S. Belakoskiy, V. B. Spirichev, and A. S. Ushakov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 108-113 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med., (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 74-77 (For primary document see N83-13783 04-51)
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The 24,25-Dihydroxycholecalciferol, and active D3 vitamin metabolite, at a dosage of 1.25 micro g/day/ animal prevents bone osteoporotic changes, effectively stimulates the diaphyseal and epiphyseal mineralization, and corrects hypocalciemia of hypokinetic rats. It is found that 24,25 (OH)2D3 at this dosage does not increase nephrocalcinosis and does not produce the toxic effect as measured by body mass variations. E.A.K.

N83-13800# Joint Publications Research Service, Arlington, Va.
AUTONOMY OF OTOLITHIC NYSTAGMUS CENTERS **c52**
In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 114-119 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 77-80 (For primary document see N83-13783 04-51)
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Pigeons (Columba livia) with unilaterally sectioned saccular nerves (Ramuli sacculi) were rotated in the dark along the horizontal plane. The nystagmic reaction which developed when the vestibular apparatus was simultaneously exposed to otolithic and canal stimuli, each of which taken separately causes nystagmus of the same direction, and is less pronounced in canal stimulation. It is indicated that the otolith nystagmus centers are an autonomous mechanism. E.A.K.

N83-13801# Joint Publications Research Service, Arlington, Va.
DIRECT-READING DOSIMETERS USED FOR MONITORING RADIATION IN SALYUT STATIONS **c35**
V. V. Markelov and I. V. Chernykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 120-124 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 81-84 (For primary document see N83-13783 04-51)
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The PPD-2 dosimeter was used for daily radiation dose measurements of the same site of the Salyut-3, Salyut-4 and Salyut-5 stations (1974-1977). The doses were estimated to be about 13-16 mrad/day. During the flight of the Salyut-6 station (1977-1979) daily doses were measured at different sizes and varied significantly. By 1980, due to an increase in solar activity and lack of solar flares, the difference in the daily doses inside the station (except for the transfer module) reached the level of the error of measurements. E.A.K.

N83-13802# Joint Publications Research Service, Arlington, Va.
IDENTIFICATION OF HEAVY NUCLEI IN RADIOBIOLOGICAL EXPERIMENTS IN SPACE **c72**
A. A. Marennyy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 84-87 (For primary document see N83-13783 04-51)
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Heavy nuclei which are important in assessing and forecasting radiation hazards of cosmic rays are considered. Information on the effects of these particles on biological systems, together with other spaceflight factors, as well as precise data on flux and charge energy spectra of heavy nuclei in specific orbits is presented. Dielectric track detectors (DTD) are used because of their qualities, which are high charge and spatial resolution, selective registration of heavy nuclei against a background of protons and alpha particles. E.A.K.

N83-13803# Joint Publications Research Service, Arlington, Va.
SEROTONIN CONCENTRATION IN ISOLATED NUCLEI OF THE HYPOTHALAMUS, LIMBIC SYSTEM AND BRAIN OF RATS FOLLOWING FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
J. Chulman, R. Kwetniansky, and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 131-135 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 87-89 (For primary document see N83-13783 04-51)
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Serotonin (5-hydroxytryptamine) in isolated nuclei of the rat hypothalamus, limbic system, brain stem and cerebellum after a long term spaceflight aboard Cosmos-1129 biosatellite was investigated. It is noted that the greatest changes in serotonin concentration are observed in some hypothalamic nuclei of flight group rats submitted to repeated immobilization after the flight. It appears that reactivity of the hypothalamic serotoninergic system of these animals was altered; which could be significant to the regulation of various autonomic functions. E.A.K.

N83-13804# Joint Publications Research Service, Arlington, Va.
GAZE FIXATION USED TO SUPPRESS VESTIBULAR NYSTAGMUS **c52**
G. I. Gorgiladze, S. P. Ritter, V. N. Sarychev, and V. N. Sablin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 136-139 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5,

Sep. - Oct. 1982 p 90-91 (For primary document see N83-13783 04-51)
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The role of fixation in suppressing vestibular nystagmus was studied. High speed aviation and cosmonautics create adverse conditions for normal function of the vestibular system. Regulation of vestibular reactions by other sensory systems, in particular vision, eliminates or alleviates undesirable vestibular reactions. It is found that the vertigo and spatial illusions which occur in weightlessness become more marked when the eyes are closed. E.A.K.

N83-13805# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE EVALUATION OF EFFECTS OF PHYSICO-CHEMICAL AND TECHNOLOGICAL FACTORS ON WATER REGENERATION PROCESS **c54**
N. M. Krivobok, V. B. Gaydadymov, V. V. Nosov, and G. G. Ter-Minasyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 140-143 refs Transl. into ENGLISH from Kosm. Biol. i Aviaosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 92-93 (For primary document see N83-13783 04-51)
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The effects of physicochemical and technological factors on the process of component-A removal from fluid in an electrolyzer, orthogonal planning were evaluated. The implication of technological development of the creation of space life support systems which operate for a long period of time regenerate water from various water containing products and waste formed right on board a manned space vehicle, as well as constant sediment of existing processes. The parameters of ground based testing of equipment which was developed, are examined. It is suggested that experimental research could be improved substantially by studying the methodology of mathematical experiment planning, which permits obtaining the necessary information with minimum expenditure of time and resources. E.A.K.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N83-13806 Royal Aircraft Establishment, Farnborough (England).
HEART RATE AS AN IN-FLIGHT MEASURE OF PILOT WORKLOAD
Alan H. Roscoe Mar. 1982 17 p refs Presented at USAF AFFTC/NASA Dryden/AIAA Workshop on Flight Testing to Identify Pilot Workload and Pilot Dyn., Edwards AFB, Ca., Jan. 1982
(RAE-TM-FS(B)-464; BR84151) Copyright. Avail: Issuing Activity

The relationship between a pilot's heart rate and his workload, whether heart rate is a valid and reliable indicator of workload (and, if so, how it should be used), and the neurophysiological mechanisms involved are discussed. Examples of heart rate were selected from more than 3000 plots recorded during flight tests. There is good evidence that heart rate increases with increased workload. Differences in heart rate values seem to indicate relative differences in workload. Heart rate is best used in conjunction with a good workload rating scale. Heart rate appears to be related to arousal. Author (ESA)

N83-13807# New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology.
BREATHING AND THE CONTROL OF HEART RATE Ph.D. Thesis
Erica Potter Jan. 1981 221 p refs
Avail: NTIS HC A10/MF A01

The neural basis of the relationship between heart rate and breathing was studied. Four reflexes that slow the heart were studied: the baroreceptor reflex, the chemoreceptor reflex, the diving response, and the oculoardiac reflex. Heart rate was studied in anaesthetised dogs and conscious human subjects. Dogs were chosen as experimental animals because even when anaesthetised they maintain a high level of cardiac vagal tone. More quantitative aspects of the interaction of breathing with the neural control of heart rate were studied in anaesthetised dogs by recording activity in single vagal efferent nerve fibres running to the heart. Each of the reflexes studied was found to slow the heart only, or most effectively, in the expiratory phase of breathing. Author

N83-13808# RAND Corp., Santa Monica, Calif.
MODELS FOR HUMAN EXPOSURE TO AIR POLLUTION
Naihua Duan Jul. 1982 21 p refs Sponsored by Dept. of Health and Human Services
(RAND/N-1884-HHS/RC) Avail: NTIS HC A02/MF A01

Four models for human exposure to air pollution are discussed and compared. Simple microenvironment monitoring measures pollutant concentrations at fixed locations, regarded as proxies for similar locations or microenvironments. This model does not require pollutant measurements on the individual level, therefore is easy to implement. However, the model can be used only to estimate the average exposure in a population and does not provide any estimate of the variability and distribution of individual exposures. Replicated microenvironment monitoring provides some estimates of the variability and distribution. However, because of the possible discrepancy between the microenvironment concentration distribution and the individual concentration distribution, some adjustment might be necessary. Integrated personal monitoring allows direct estimation of the average exposure as well as the variability and distribution of individual exposures. Coupled with the appropriate time budget data, a regression analysis can be applied to estimate the contribution from each microenvironment type. B.W.

N83-13809# Pennsylvania State Univ., University Park. Biomechanics Lab.
EFFECTS OF GENDER, LOAD, AND BACKPACK ON EASY STANDING AND VERTICAL JUMP PERFORMANCE, VOLUME 2 Final Report, 1 Oct. 1979 - 31 Aug. 1981
Richard C. Nelson and Phillip E. Martin Natick, Mass. Army Natick Research and Development Labs. Mar. 1982 78 p refs 4 Vol.
(Contract DAAK60-79-C-0131; DA Proj. 1L1-62723-AH-98)
(AD-A119129; Natick-TR-82/016; Natick/IPL-240) Avail: NTIS HC A05/MF A01 CSCL 05/5

This study was conducted to determine the effects of loads worn or carried and the type of backpack used on parameters of the easy standing and vertical jumping performance of men and women. Analyses of the easy standing data indicated that both men and women demonstrated greater stability with the medium than with the lighter or heavier loads. The internal frame backpack resulted in greater postural stability relative to the three, external-frame systems. Increasing loads produced a systematic, linear decrease in vertical jumping performance. Analyses of the effects of backpacks on the parameters of jumping performance revealed few differences among the packs. However, it was found that height of jump was somewhat better with the internal frame system than with the external-frame backpacks. Additional analyses were carried out on the trial-to-trial reliability of easy standing and on ground reaction force parameters of vertical jumping adjusted for body weight and system weight. GRA

N83-13810# Science Information Services, Inc., Philadelphia, Pa.
BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION: A DIGEST OF CURRENT LITERATURE, OCTOBER THRU DECEMBER 1981. VOLUME 6, NUMBER 2
Bruce Kleinstein Apr. 1982 121 p
(Contract NT-81-SAC-00064)
(PB82-226853; NTIA/CR-82/19) Avail: NTIS HC A06/MF A01 CSCL 05R

Current awareness information on biological effects and health implications of microwave and other radio frequency radiation is provided. The effects of electric and magnetic fields (static and alternating) and research on medical applications of these nonionizing electromagnetic radiations are also included. Each issue contains abstracts of current English and foreign-

language research literature, research summaries, news items and announcements and information on relevant meetings and conferences. Subject and author indices are provided for all literature abstracts to facilitate specific search and reference use.
Author (GRA)

N83-13811# National Bureau of Standards, Washington, D.C. National Engineering Lab.
FURTHER DEVELOPMENT OF A TEST METHOD FOR THE ASSESSMENT OF THE ACUTE INHALATION TOXICITY OF COMBUSTION PRODUCTS
Barbara C. Levin, Andrew J. Fowell, Merritt M. Birky, Maya Paabo, Alan Stolte, and Dolores Malek Jun. 1982 146 p refs
(PB82-217886; NBSIR-82-2532) Avail: NTIS HC A07/MF A01 CSCL 06T

The development of a test method for the assessment of acute inhalation toxicity of combustion products of materials is discussed. The procedure primarily intended for research and screening purposes, provides: (1) a method for determining, under flaming and non-flaming conditions, the LC(50) (the concentration of combustion products which causes 50% lethality in the test animals (rats) exposed for 30 minutes and observed for 14 days following exposure); (2) an optional procedure to examine materials which rapidly produce combustion products which cause death of test animals within a 10 minute exposure and a 14 day post-exposure observation period; and (3) a description of analytical and physiological measurements which can provide more detailed information on the nature of the toxic effects of combustion products. Limitations of the test method are identified and future work to address them is proposed. GRA

N83-13785# Joint Publications Research Service, Arlington, Va.
STATIC ELECTRIC AND ELECTROMAGNETIC LOW-FREQUENCY FIELDS (BIOLOGICAL EFFECTS AND HYGIENIC ASSESSMENT)
B. I. Davydov and V. N. Karpov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 21-30 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 18-23 (For primary document see N83-13783 04-51)
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N83-13786# Joint Publications Research Service, Arlington, Va.
POSSIBLE USE OF ULTRASONIC BIOLOGICAL ECHOLOCATION AS A NONINVASIVE METHOD OF EVALUATING INTRACRANIAL VOLUMES IN MAN
L. G. Simonov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 31-38 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 24-28 (For primary document see N83-13783 04-51)
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N83-13788# Joint Publications Research Service, Arlington, Va.
BALLISTOCARDIOGRAPHIC STUDIES DURING FOURTH MISSION ABOARD SALYUT-6 ORBITAL STATION
R. M. Bayevskiy and I. I. Funtova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 46-51 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 34-37 (For primary document see N83-13783 04-51)
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N83-13789# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ASSESSMENT OF CIRCULATORY REACTION DURING WORK IN WEIGHTLESSNESS AND IN SALYUT STATION MOCKUP
V. G. Doroshev, N. A. Lapshina, Z. A. Kirillova, O. B. Kulikov, A. V. Kaliberdin, and S. I. Ponomarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 52-56 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), Vol. 16 no. 5, Sep. - Oct. 1982 p 38-40 (For primary document see N83-13783 04-51)
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N83-13790# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF HUMAN EYE AND HEAD MOVEMENTS DURING GAZE FIXATION REACTION
Yu. V. Kreydich, A. A. Repin, V. A. Barmin, and I. B. Kozlovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 57-63 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 40-44 (For primary document see N83-13783 04-51)
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N83-13791# Joint Publications Research Service, Arlington, Va.
CENTRAL CIRCULATION IN HEALTHY MAN DURING 7-DAY HEAD-DOWN HYPOKINESIA
V. Ye. Katkov, V. V. Chestukhin, E. M. Nikolayenko, S. V. Gvozdev, V. V. Rumyantsev, T. M. Gueynova, and I. A. Yegorova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 64-72 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 45-51 (For primary document see N83-13783 04-51)
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N83-13792# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS OF CARDIOVASCULAR REACTIONS IN IMMEDIATE LBNP AFTEREFFECT PERIOD
L. Ya. Andriyako, V. G. Voloshin, and V. A. Degtyarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 73-77 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 51-54 (For primary document see N83-13783 04-51)
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N83-13793# Joint Publications Research Service, Arlington, Va.
FEASIBILITY OF SIMULATING HEMODYNAMIC EFFECTS OF WEIGHTLESSNESS WITH USE OF POSITIVE PRESSURE
A. S. Nekhayev, V. A. Degtyarev, V. S. Bednenko, and Z. A. Kirillova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 78-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med., (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 54-57 (For primary document see N83-13783 04-51)
Avail: NTIS HC A08

N83-13794# Joint Publications Research Service, Arlington, Va.
EVALUATION OF MAN'S PHYSICAL CONDITIONING ACCORDING TO ENERGETICALLY OPTIMUM WALKING SPEED
In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 82-85 refs Transl. into ENGLISH from Kosm. Biol. i Aviaosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 57-59 (For primary document see N83-13783 04-51)
Avail: NTIS HC A08

N83-13799# Joint Publications Research Service, Arlington, Va.
ROLE OF 24,25-DIHYDROXYCHOLECALCIFEROL IN BONE MINERALIZATION IN HYPOKINETIC RATS
I. N. Sergeyev, N. V. Blazheyevich, M. S. Belakoskiy, V. B. Spirichev, and A. S. Ushakov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 108-113 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med., (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 74-77 (For primary document see N83-13783 04-51)
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N83-13800# Joint Publications Research Service, Arlington, Va.
AUTONOMY OF OTOLITHIC NYSTAGMUS CENTERS
In its USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 114-119 refs Transl. into ENGLISH

from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 77-80 (For primary document see N83-13783 04-51)
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N83-13804# Joint Publications Research Service, Arlington, Va.
GAZE FIXATION USED TO SUPPRESS VESTIBULAR NYSTAGMUS
G. I. Gorgiladze, S. P. Ritter, V. N. Sarychev, and V. N. Sablin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 136-139 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 90-91 (For primary document see N83-13783 04-51)
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53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-13812# Illinois Univ., Urbana. Electromagnetics lab.
ANALYSIS OF DOMINANT AND HIGHER-ORDER MODES IN UNILATERAL FIN LINES Interim Technical Report
Y. Hayashi, E. Farr, and R. Mittra Aug. 1982 26 p refs
(Contract DAAG29-82-K-0084)
(AD-A118924; UIEM-82-9; UILU-ENG-82-2548; ARO-18054.3-EL) Avail: NTIS HC A03/MF A01 CSCL 09/5

In this paper, an analysis of dominant and higher-order modes in unilateral fin lines is presented. The network analysis method of electromagnetic fields is used along with Galerkin's method to obtain a determinantal equation. Numerical results are presented.
Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-13813# Aeronautical Research Labs., Melbourne (Australia).
BRITTLE FRACTURE OF CRASH HELMETS
S. R. Sarrailhe and G. Paul Feb. 1982 22 p refs
(ARL-Struc-Report-389; AR-002-332) Avail: NTIS HC A02/MF A01

The polycarbonate shell of the protective helmet worn by a police motor cyclist shattered in a fatal accident. The conditions which could cause brittle failure in this normally tough material were investigated with particular reference to the effects of hydrocarbon solvents (including petrol), impact at high speed (about 60 km/h) and the support to the helmet provided by the solid test headform. Comparative impacts were made onto a helmet with a fiberglass (GRP) shell.
Author

N83-13814*# National Aeronautics and Space Administration, Washington, D. C.
NASA FACTS: FOOD FOR SPACE FLIGHT
[1981] 8 p
(NASA-NF-1336-82; NAS 1.20:1336-82) Avail: NTIS HC A02/MF A01

A history of space flight feeding is reviewed. The menu and preparation of food on the space shuttle are described.
S.L.

N83-13815# RAND Corp., Santa Monica, Calif.
CREW ROLES IN MILITARY SPACE OPERATIONS
David Leinweber Mar. 1982 42 p refs
(RAND/P-6745) Avail: NTIS HC A03/MF A01 CSCL 05H

Future military roles of crews in space are discussed. It is pointed out that military space goals have not been set, organizations to carry out required training and development activities have not fully emerged, and no commitments have been made. It is concluded that what is needed is a commitment to explore the possibilities, to experiment, and to acquire a sound knowledge base on which to make an informed judgment on the future military role of men in space.
L.F.M.

N83-13816# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va. Training Research Lab.
TRAINING SIMULATOR FIDELITY GUIDANCE: THE ITERATIVE DATA BASE APPROACH
Robert T. Hays Sep. 1981 37 p refs
(DA Proj. 2Q1-62717-A-790)
(AD-A119159; ARI-TR-545) Avail: NTIS HC A03/MF A01 CSCL 05/1

This paper provides a preliminary organizational framework for a training simulator fidelity data base. Such a data base can provide a starting point for the development of a formal training simulator fidelity decision-making package and can also be the basis for the determination of future research. The organizational structure of the data base is developed in three stages. First, the issue of determining the minimum required fidelity for a training simulator is located in its place within the context of the ISD process. Second, the necessary informational inputs to the fidelity decision process from task analyses are discussed with the goal of obtaining more useful information for making fidelity decisions. Finally, a proposed structure for making fidelity decisions and for conducting future research is presented. This structure is derived from the use of a proposed iterative data base of empirically derived data on the relationship between simulator fidelity and training effectiveness.
GRA

N83-13817# Riso National Lab., Roskilde (Denmark). Electronics Dept.
NOTES ON HUMAN PERFORMANCE ANALYSIS
E. Hollnagel, O. M. Pedersen, and J. Rasmussen Jun. 1981 85 p refs
(DE81-700315; RISO-M-2285; ISBN-87-550-0756-2; ISSN-0418-6435) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The integration of observation and analysis of human performance in nuclear environments - real or simulated is considered. Four main sources of data are identified, and the characteristic data types and methods of analysis for each source in relation to a common conceptual background are described. The general conclusion is that it is highly useful to combine the knowledge and experience from different contexts into coherent picture of how nuclear operators perform under varying circumstances. DOE

N83-13818# Sheffield Univ. (England). Dept. of Control Engineering.
DYNAMIC MODELLING OF A FOUR-DEGREE-OF-FREEDOM ROBOTIC MANIPULATOR
A. S. Morris and F. Neea May 1982 22 p refs
(RR-190) Avail: NTIS HC A02/MF A01

The equations of motion of a mechanical arm with respect to a nonstationary coordinate system were derived, using the general formula for the absolute acceleration of a moving point in free space. In order to model a robot arm, the general formula for torque applied to a joint was derived in terms of inertia and masses. The resulting model is useful without modification for arm speed control, but the effect of bending movements in the arm links must be included in the analysis before the model can be used for accurate position control.
Author (ESA)

N83-13784# Joint Publications Research Service, Arlington, Va.
PREFLIGHT DIET FOR FLIGHT PERSONNEL
I. G. Popov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 1-20 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 4-17 (For primary

document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

N83-13787# Joint Publications Research Service, Arlington, Va.
SAFETY CRITERION FOR PROTECTION OF PILOT'S HEAD AGAINST IMPACTS
A. S. Barer, Yu. G. Konakhevich, and L. N. Sholpo *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 39-45 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 29-33 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

N83-13805# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE EVALUATION OF EFFECTS OF PHYSICO-CHEMICAL AND TECHNOLOGICAL FACTORS ON WATER REGENERATION PROCESS
N. M. Krivobok, V. B. Gaydadymov, V. V. Nosov, and G. G. Ter-Minasyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 140-143 refs Transl. into ENGLISH from Kosm. Biol. i Aviaosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 92-93 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N83-13819*# Michigan Univ., Ann Arbor. Computing Research Lab.
DESIGN AND EVALUATION OF A FAULT-TOLERANT MULTIPROCESSOR USING HARDWARE RECOVERY BLOCKS
Yann-Hang Lee and Kang G. Shin Aug. 1982 54 p refs
(Grant NAG1-296)
(NASA-CR-169560; NAS 1.26:169560) Avail: NTIS HC A04/MF A01 CSCL 09B

A fault-tolerant multiprocessor with a rollback recovery mechanism is discussed. The rollback mechanism is based on the hardware recovery block which is a hardware equivalent to the software recovery block. The hardware recovery block is constructed by consecutive state-save operations and several state-save units in every processor and memory module. When a fault is detected, the multiprocessor reconfigures itself to replace the faulty component and then the process originally assigned to the faulty component retreats to one of the previously saved states in order to resume fault-free execution. A mathematical model is proposed to calculate both the coverage of multi-step rollback recovery and the risk of restart. A performance evaluation in terms of task execution time is also presented. M.G.

N83-13820# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A MULTIPORT BUFFER MEMORY FOR AN INTERNET PACKET VOICE/DATA GATEWAY
Vincent J. Sferrino 14 Jul. 1982 68 p ref
(Contract F19628-80-C-0002; ARPA Order 3673; AF Proj. 2D10; AF Proj. 2T10)
(AD-A119157; TR-612; ESD-TR-82-056) Avail: NTIS HC A04/MF A01 CSCL 09/2

The internet packet voice/data gateway is for an experimental wideband satellite network. The gateway consists of a central processor and a number of microprocessor-controlled interfaces to local networks at each site and to the satellite network. The Multiport Buffer Memory is accessible from any of these microprocessors, and increases system throughput by allowing the bulk of the packet traffic between the networks to pass through it without having to pass through the central processor. The shared memory consists of a main memory organized as 64K words x 16 bits and an auxiliary pointer memory of 4K words x 16 bits. The Multiport Buffer Memory complex includes an automated intelligent memory management strategy which makes the memory resource allocation transparent to the microprocessor-based systems which share the memory. GRA

N83-13821# Lincoln Lab., Mass. Inst. of Tech., Lexington.
NEW CONSOLE INTERFACE SYSTEM
Andrew J. Wardrop 14 Jul. 1982 54 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A119156; ETS-65; ESD-TR-82-048) Avail: NTIS HC A04/MF A01 CSCL 09/2

A new console interface system has been designed and built for the Experimental Test Site (ETS) of the Ground Electro-Optical Deep Space Surveillance (GEODSS) program using microprocessor technology. The new system allows current and future microprocessor based subsystems to be conveniently integrated into the overall system. Serial interfaces, high performance, multi-use DMA interfaces, and shared memory systems are extensively used. The use of LSI, standard microcomputer boards, and built-in tests and diagnostics is expected to result in a more reliable and maintainable system. Author (GRA)

N83-13822# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
THE GEORGIA INSTITUTE OF TECHNOLOGY RESEARCH PROGRAM IN FULLY DISTRIBUTED PROCESSING SYSTEMS Quarterly Progress Report, 1 Mar. - 31 May 1982
Aug. 1982 11 p
(Contracts N00014-79-C-0873; F30602-78-C-0120; F30602-81-C-0249; DAAG29-79-C-0155; Grant NSF MCS-79-24370
(AD-A118954; QPR-11) Avail: NTIS HC A01/MF A01 CSCL 09/2

The Georgia Tech Research Program in Fully Distributed Processing Systems is a comprehensive investigation of data processing systems in which both the physical and logical components are extremely loosely coupled while operating with a high degree of control autonomy at the component level. The definition of the specific class of multiple computer systems being investigated, and the operational characteristics and features of those systems is motivated by the desire to advance the state-of-the-art for that class of systems that will deliver a high proportion of the benefits currently being claimed for distributed processing systems. The scope of individual topics being investigated under this program ranges from formal modeling and theoretical studies to empirical examinations of prototype systems and simulation models. Also included within the scope of the program are areas such as the utilization of FDPS's and their interaction with management operations and structure. GRA

N83-13823# General Dynamics/Convair, San Diego, Calif.
DIGITAL INTEGRATING SUBSYSTEM (DIS) Final Report, 1 May 1979 - 15 May 1981

K. D. Arnold, D. I. Burgess, J. F. Fassel, E. F. Godenschwager, and B. J. Haire Eglin AFB, Fla. AF Armament Lab. Oct. 1981 168 p refs
(Contract F08635-79-C-0206; AF Proj. 670B)
(AD-A119380; AD-E800596; CS64-32228; AFATL-TR-81-83) Avail: NTIS HC A08/MF A01 CSCL 09/2

This DIS program has been successful in demonstrating that a small, potentially low-cost, high order language, airborne computer is possible. Twenty-five of these units have been delivered after extensive testing of both software and hardware compatibility. In addition, DIS Diagnostic Stations, used to host source and object JOVIAL files as well as all necessary programming tools, were also designed, tested, and delivered. The use of a distributed microprocessor system will provide a number of benefits yet to be verified in such programs as Midcourse Guidance Demonstration (MGD), Medium Range Air to Surface Missile (MRASM), and low-cost tactical systems. Integration of various subsystems is facilitated by the use of the DIS distributed, modular architecture. However, even in light of the positive aspects of the DIS systems, a number of concerns have surfaced and must be addressed if such a system is actually projected for use in a full scale engineering development (FSED) weapon system. These concerns either have met with little success (mature hardware and software in a cost-effective production form) or no success (establishment of interface standards and specifications). GRA

N83-13824# Technische Universitaet, Brunswick (West Germany). Inst. fuer Flugfuehrung.
DESIGN AND CONSTRUCTION OF A FLEXIBLE AUTONOMOUS ELECTRONIC DISPLAY DEVICE Ph.D. Thesis - Tech. Univ. Carolo-Wilhelmina [ENTWURF UND AUFBAU EINES FLEXIBEN AUTONOMEN ELEKTRONISCHEN ANZEIGEGERAETES]
Rudolf Frieling 1980 166 p refs In GERMAN
(TUBS/FB-80-12-02) Avail: NTIS HC A08/MF A01

The design criteria for development and construction of a compact, autonomous display device for research in the domain of flight control are presented. A display device was required with which synthetic graphic pictures can be shown and dynamic processes can be recorded. Such a device is not commercially available. It consists of a microprocessor and an image element generator which is essentially composed of increment calculating circuits in a modular way. The detailed mathematical description of the generation of conical sections as image elements and their linear transformation enables a universal utilization in practice. Performance and efficiency of the system are demonstrated by means of two examples. Author (ESA)

N83-13825# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ON THE MC ALGOL 68 COMPILER
L. G. L. T. Meertens and J. C. vanVliet Dec. 1981 9 p refs
(MC-IW-189/81) Avail: NTIS HC A02/MF A01

Research was done with regards to various aspects of ALGOL 68 implementation. This resulted in many publications, several of which deal with issues that arise in the construction of a portable ALGOL 68 compiler for the full language, including the standard hardware representation, the modules, and separate compilation facility. These publications treat, especially, the first stage (the construction of a parser) and the last stage (an abstract ALGOL 68 machine). Where these various results would find their place in the construction of an ALGOL 68 compiler is indicated. Author (ESA)

N83-13826# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
REAL TIME SIMULATION OF MULTICOUNTERS BY OBLIVIOUS ONE-TAPE TURING MACHINES
Paul M. B. Vitanyi Feb. 1982 7 p refs Presented at 14th Ann. Symp. on Theory of Computing, San Francisco, 5-7 May 1982 Submitted for publication
(MC-IW-193/82) Avail: NTIS HC A02/MF A01

The question of whether or not multicounter machines can be simulated in real time by one tape Turing machines is examined. The multicounter machine definition and the concept of obliviousness are discussed. It is shown that the one tape Turing machines are oblivious and can simulate real time multicounter machines. It is also shown that the first n steps of a multicounter machine can be implemented on a fast low-cost combinational logic network. Author (ESA)

N83-13827# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
EFFICIENT SIMULATIONS OF MULTICOUNTER MACHINES
Paul M. B. Vitanyi Mar. 1982 19 p refs Presented at the 9th Intern. Colloq. on Automata, Languages and Programming, Springer Verlag, Netherlands, 1982 Submitted for publication
(MC-IW-197/82) Avail: NTIS HC A02/MF A01

An oblivious one-tape Turing machine that can on-line simulate a multicounter machine in linear time and logarithmic space is considered. This leads to a linear cost combinational logic network, implementing the first n steps of a multicounter machine, and also to a linear time/logarithmic space on-line simulation by an oblivious logarithmic cost RAM. It is also shown that an oblivious log * n-head tape unit can simulate the first n steps of a multicounter machine in real time, which leads to a linear cost combinational logic network with a constant data rate. Author (ESA)

N83-13828# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
PREEMPTIVE SCHEDULING OF PRECEDENCE-CONSTRAINED JOBS ON PARALLEL MACHINES
E. L. Lawler (California Univ., Berkeley) Nov. 1981 26 p refs Submitted for publication
(Grant NSF MCS-78-20054)
(MC-BW-132/81) Avail: NTIS HC A03/MF A01

Polynomial time-bounded algorithms for the solution of three problems which involve the preemptive scheduling of precedence-constrained jobs on parallel machines are presented: the intree problem; the two-machine problem with equal releases dates; and the general two-machine. These problems are preemptive counterparts of problems which involve the nonpreemptive scheduling of unit-time jobs. The algorithms, proofs, and the running times of the algorithms closely parallel results for these other problems. These results improve on previous results in preemptive scheduling and also suggest a close relationship between preemptive scheduling problems and problems in nonpreemptive scheduling of unit-time jobs. Author (ESA)

N83-13829# Manchester Univ. (England). Control Systems Centre.
MICROPROCESSOR BASED PARALLELLED COMPUTERS, THEIR SIMULATION AND APPLICATION TO CONTROL PROBLEMS
D. Aldabass Jan. 1981 12 p refs
(PB82-223066; Control-Systems-Centre-501) Avail: NTIS HC A02/MF A01 CSCL 09B

The need for high speed processing is briefly outlined, and some related areas of research are described. The areas covered are: parallel processing configurations based on microprocessors, the simulation of these systems to investigate effectiveness and implementation detials, and application to the solution of control algorithms. Author (GRA)

N83-13830# Science Research Council, Chilton (England). Data Handling Group.
VT-100 GRAPHICS CONTROL PROCEDURES
N. Griffiths 1982 36 p
(PB82-226499; RL-82-028) Copyright. Avail: NTIS HC A03/MF A01 CSCL 09B

A library of subroutines which drive a DEC VT-100 video terminal is described. The routines give the user access to all the facilities available on this terminal as well as providing high-level histogram and bar-chart drawing. It forms part of a larger project which includes a graphics library for the more sophisticated DEC

VT-125 graphics display terminal (this combines a bit-map architecture with the semi-graphics capability of the VT-100). GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-13831*# Purdue Univ., Lafayette, Ind.
THE GRASP 3: GRAPHICAL RELIABILITY ANALYSIS SIMULATION PROGRAM. VERSION 3: A USERS' MANUAL AND MODELLING GUIDE
Don T. Phillips, Belkacem Manseur, and Joseph W. Foster Jul. 1982 305 p refs Sponsored in part by the Army
(Grants NsG-2226; NSF ATA-73-07822)
(NASA-CR-169531; NAS 1.26:169531) Avail: NTIS HC A14/MF A01 CSCL 09B

Alternate definitions of system failure create complex analysis for which analytic solutions are available only for simple, special cases. The GRASP methodology is a computer simulation approach for solving all classes of problems in which both failure and repair events are modeled according to the probability laws of the individual components of the system. S.L.

N83-13832# Comptroller General of the United States, Washington, D.C.
IMPROVING COBOL APPLICATIONS CAN RECOVER SIGNIFICANT COMPUTER RESOURCES Report to the Congress
1 Apr. 1982 77 p refs
(AFMD-82-4) Avail: NTIS HC A05/MF A01; HC also available from SOD

Opportunities for savings by reducing the resources consumed by existing COBOL applications are explored. It is noted that efforts to reduce machine resource consumption must be carefully managed, so as not to conflict with other automatic data processing management objectives. A checklist to guide data processing managers in such work is included. M.G.

N83-13833# Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.
COMPUTER GRAPHICS DISPLAY OF MOTION OF A SHUTTLE-ATTACHED DIPOLE ANTENNA
F. R. Vigneron and M. Savoie Sep. 1982 31 p refs
(CRC-1359) Avail: NTIS HC A03/MF A01

A computer-generated animation of the dynamics of a flexible body which consists of a long dipole antenna mounted on the Shuttle is described. The animation facility consists of a PDP-11/45 and a modified NORPAK incremental graphics processor (IGP). An analytical formulation, in which the antenna deformation is represented with a product series of time dependent variables and simple polynomial shape coordinates, was found to be a good choice for the animation. The computer and graphics facility enabled efficient on-line animation. In a mode where calculations are done off-line, speeds of 60 times faster than real time were achieved with no problems. S.L.

N83-13834# RAND Corp., Santa Monica, Calif.
AN INVESTIGATION OF TOOLS FOR BUILDING EXPERT SYSTEMS
D. A. Waterman and Frederick Hayes-Roth 14 Dec. 1982 84 p refs
(Grant NSF MCS-79-26532)
(RAND/R-2818-NSF) Avail: NTIS HC A05/MF A01

An investigation into the comparative merits of eight very high-level programming languages designed for building expert systems is described. In the investigation, all eight languages were applied to the same environmental crisis management problem, which involved the creation of an on-line assistant to aid in locating and containing an oil or hazardous chemical spill at the Oak Ridge National Laboratory. L.F.M.

N83-13835*# Michigan Univ., Ann Arbor. Interferometry Lab.
COMPUTER TOMOGRAPHY OF FLOWS EXTERNAL TO TEST MODELS Final Technical Report, 1 Jun. 1981 - 31 Aug. 1982
I. Prikryl and C. M. Vest Oct. 1982 337 p refs
(Grant NAG2-118)
(NASA-CR-169521; NAS 1.26:169521; INTFL-8202) Avail: NTIS HC A15/MF A01 CSCL 09B

Computer tomographic techniques for reconstruction of three-dimensional aerodynamic density fields, from interferograms recorded from several different viewing directions were studied. Emphasis is on the case in which an opaque object such as a test model in a wind tunnel obscures significant regions of the interferograms (projection data). A method called the Iterative Convolution Method (ICM), existing methods in which the field is repesented by a series expansions, and analysis of real experimental data in the form of aerodynamic interferograms are discussed. Author

N83-13836*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION OF MANAGEMENT MEASURES OF SOFTWARE DEVELOPMENT. VOLUME 1: ANALYSIS SUMMARY
Jerry Page, David Card, and Frank McGarry Sep. 1982 142 p refs Prepared in cooperation with Computer Sciences Corp., El Segundo, Calif. 2 Vol.
(NASA-TM-85146; NAS 1.15:85146; SEL-82-001-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09B

The conceptual model, the data classification scheme, and the analytic procedures are explained. The analytic results are summarized and specific software measures for collection and monitoring are recommended. S.L.

N83-13837*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION OF MANAGEMENT MEASURES OF SOFTWARE DEVELOPMENT. VOLUME 2: DATA DESCRIPTION
Jerry Page, David Card, and Frank McGarry Sep. 1982 380 p refs Prepared in cooperation with Computer Sciences Corp., El Segundo, Calif. 2 Vol.
(NASA-TM-85147; NAS 1.15:85147; SEL-82-001-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 09B

A detailed description of the data analyzed including definitions of measures, lists of values, and summary statistics are presented. The results of the computer analyses are included. S.L.

N83-13838*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FORTRAN STATIC SOURCE CODE ANALYZER PROGRAM (SAP) SYSTEM DESCRIPTION
William Decker, William Taylor, Phil Merwarth, Mike ONeill, Charles Goorevich, and Sharon Waligora Aug. 1982 228 p refs Prepared in cooperation with Computer Sciences Corp., El Segundo, Calif.
(NASA-TM-85144; NAS 1.15:85144; SEL-82-002;
CSC/SD-82/6045) Avail: NTIS HC A11/MF A01 CSCL 09B

A source code analyzer program (SAP) designed to assist personnel in conducting studies of FORTRAN programs is described. The SAP scans FORTRAN source code and produces reports that present statistics and measures of statements and structures that make up a module. The processing performed by SAP and of the routines, COMMON blocks, and files used by SAP are described. The system generation procedure for SAP is also presented. M.G.

N83-13839*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANNOTATED BIBLIOGRAPHY OF SOFTWARE ENGINEERING LABORATORY (SEL) LITERATURE
David Card Nov. 1982 97 p Prepared in cooperation with Computer Sciences Corp., El Segundo, Calif.
(NASA-TM-84724; NAS 1.15:84724; SEL-82-006;
CSC/SD-82/6209) Avail: NTIS HC A05/MF A01 CSCL 09B

An annotated bibliography of technical papers, documents, and memorandums produced by or related to the Software Engineering

Laboratory is presented. More than 75 publications are summarized. An index of these publications by subject is also included. These publications cover many areas of software engineering and range from research reports to software documentation. M.G.

N83-13840*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RAYLEIGH CURVE AS A MODEL FOR EFFORT DISTRIBUTION OVER THE LIFE OF MEDIUM SCALE SOFTWARE SYSTEMS M.S. Thesis - Maryland Univ.
Gino O. Picasso and Victor Basili Jul. 1982 154 p refs Prepared in cooperation with Maryland Univ., College Park
(Grant NsG-5123)
(NASA-TM-84725; NAS 1.15:84725; SEL-81-012; TR-1186) Avail: NTIS HC A08/MF A01 CSCL 09B

It is noted that previous investigations into the applicability of Rayleigh curve model to medium scale software development efforts have met with mixed results. The results of these investigations are confirmed by analyses of runs and smoothing. The reasons for the models' failure are found in the subcycle effort data. There are four contributing factors: uniqueness of the environment studied, the influence of holidays, varying management techniques and differences in the data studied. Author

N83-13841# IIT Research Inst., Rome, N.Y.
MPP IN THE PAVE PAWS SOFTWARE MAINTENANCE ENVIRONMENT Final Technical Report, 17 Jun. 1980 - 17 Oct. 1981
Griffiss AFB, N.Y. RADC Jun. 1982 111 p refs
(Contract F30602-80-C-0223; AF Proj. 2528)
(AD-A119081; RADC-TR-82-169) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report presents the results of a study to establish a baseline software maintenance experience database and to determine relationships which exist on the use of Modern Programming Practices and Software Engineering Tools on the ease of software maintenance of the PAVE PAWS Phased Array Warning System. Author (GRA)

N83-13842# Dayton Univ., Ohio. School of Engineering.
ADVANCED TECHNOLOGY MULTIPLE CRITERIA DECISION MODEL Final Report, 1 Jun. 1980 - 30 Nov. 1981
Patrick J. Sweeney, Kathleen B. Berner, John R. Fraker, Daniel J. Mick, and Judy A. Sweeney Wright-Patterson AFB, Ohio AFWAL Nov. 1981 326 p refs
(Contract F33615-77-C-2059; AF Proj. 3145)
(AD-A119160; AFWAL-TR-81-2112) Avail: NTIS HC A15/MF A01 CSCL 09/2

This computerized model provides a flexible, interactive capability to solve problems involving multiple criteria. The decision model is capable of analyzing up to 10 different technology systems over 5 time increments. The program accepts up to 20 quantitative and qualitative parametric descriptions for each technology system. The program provides a system value comparison based on technology data base and an evaluation of the relative importance of the parameters. Author (GRA)

N83-13843# CHI Systems, Inc., Goleta, Calif.
CHI-5 SIMULATOR REFERENCE MANUAL Quarterly Technical Report, 10 May - 10 Aug. 1982
Glen J. Culler and Thomas W. Fuller 27 Aug. 1982 32 p
(Contract MDA903-82-C-0136; ARPA Order 3625)
(AD-A119139) Avail: NTIS HC A03/MF A01 CSCL 09/2

The CHI-5 Simulator is an interactive program, written in standard FORTRAN-77, which simulates the operation of a CHI-5 Array Processor. It may be used to verify the correctness of a microprogram designed to run on the CHI-5. The simulator maintains a functional model of the CHI-5. This model is composed of variables, known as state variables, which hold values corresponding to values held by elements in a real CHI-5. A set of commands is available to the user with which the values of state variables may be manipulated. Values may be changed directly, or through the simulated execution of CHI-5 instructions. A system of files and the commands to control them are provided so values in the model may be more efficiently loaded or stored. GRA

N83-13844# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ALR-46 COMPUTER GRAPHICS SYSTEM FOR THE ROBINS AIR FORCE BASE, ELECTRONIC WARFARE DIVISION, ENGINEERING BRANCH LABORATORY M.S. Thesis
J. Wayne Thames Dec. 1981 244 p refs
(AD-A119252; AFIT/GCS-EE-81D-18) Avail: NTIS HC A11/MF A01 CSCL 09/2

An ALR-46 Computer Graphics System (CGS) for the Electronic Warfare Division Engineering Branch Laboratory was designed and implemented. The system is composed of the ALR-46 Radar Warning Receiver; real time hardware monitor; PDP 11/34 computer; and two display devices, a Tektronix model 4027 CRT and a Digital Equipment Corporation (DEC) model VT-100 CRT. The ALR-46 test engineers at the Engineering Branch Laboratory were interviewed: their functional requirements were translated into a detailed set of hardware and software requirements. Structured Analysis Techniques were used to produce a structured specification for the system requirements. Yourdon and Constantine's Transform and Transaction Analysis techniques were used to develop module structure charts for the software design. The final software design phase translated the module structure charts into Warnier-Orr (W/O) diagrams. These were translated into operational software using DEC Pascal. The software was implemented and tested using a top down approach. The modules and data structures were designed to allow additional capabilities to be added to CGS with minimum impact on the current system. GRA

N83-13845# Sandia Labs., Albuquerque, N. Mex.
VERIFICATION PROBLEMS FOR ARTOO, AN AUTOMATICALLY REZONING TWO-DIMENSIONAL FINITE-DIFFERENCE WAVE-CODE
J. W. Swegle Mar. 1982 29 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015497; SAND-81-2236) Avail: NTIS HC A03/MF A01

Verification and test problems for ARTOO are provided. Each calculation contains the input used to run the job, along with both print and plot output generated by the calculation. The calculations begin with simple test problems which illustrate some aspect of the operation of the code and proceed to practical production-type problems. DOE

N83-13846# Sandia Labs., Livermore, Calif.
CRAY-1S INTEGER VECTOR UTILITY LIBRARY
J. N. Rogers and T. P. Tooman Jun. 1982 18 p refs Sponsored by DOE
(DE82-018135; SAND-82-8225) Avail: NTIS HC A02/MF A01

Thirty-five integer or packed vector utility routines and documents their testing. These routines perform various vector searches, linear algebra functions, memory resets, and vector boolean operations. They are written in CAL, the assembly language on the CRAY-1S computer. By utilizing the vector processing features of that machine, they are optimized in terms of run time. Each routine was extensively tested. DOE

N83-13847# Los Alamos Scientific Lab., N. Mex.
REAL TIME INTERRUPT HANDLING USING FORTRAN IV PLUS UNDER RSX-11M
D. E. Schultz 1981 9 p refs Presented at Fall DECUS Symp., Los Angeles, Calif., 7 Dec. 1981
(Contract W-7405-eng-36)
(DE82-004375; LA-UR-81-3435) Avail: NTIS HC A02/MF A01

A real-time data acquisition application for a linear accelerator is described. The important programming features of this application are use of connect to interrupt, a shared library, map to I/O page, and a shared data area. How you can provide rapid interrupt handling using these tools from FORTRAN IV PLUS is explained. The real time interrupt handling subroutine is given. DOE

N83-13848# Research Inst. of National Defence, Stockholm (Sweden).
ADA IN CONTROL APPLICATIONS: A CASE STUDY
Sven Erik Mattsson (Lund Univ., Sweden) Jul. 1982 31 p refs (FOA-C-20459-D8(E3)) Avail: NTIS HC A03/MF A01

The effect of ADA on a wind turbine control system design and structure is considered. Software for the rotor processor is presented. This processor handles the control loop and is interfaced with a supervisory processor. Although ADA provides powerful concepts for logical and physical modularization, interprocess communication is complicated. It is not possible to specify initialization routines which are invoked automatically when an object of (limited) private type is created. Author (ESA)

N83-13849# Electronique Serge Dassault, St. Cloud (France).
SOFTWARE ENGNEERING RESEARCH: TOOLS FOR THE CONCEPTION AND SPECIFICATION PHASES Final Report [RECHERCHE EN GENIE LOGICIEL. OUTILS POUR LES PHASES DE SPECIFICATION ET DE CONCEPTION]
P. Bardier Paris ESA 24 Mar. 1982 43 p refs In FRENCH
(Contract ESA-4539/80)
(ESD-10-929; ESA-CR(P)-1624) Avail: NTIS HC A03/MF A01

A system based on the hierarchic decomposition and abstract machines methods is presented. When used on a data base it is characterized by semiformal languages and a set of tools assuring the functions of data acquisition, control, updating, filing and editing. The system is interactive and promotes ergonomic operation. By the use of this system a cost reduction of the specification and conception is expected, since the errors commited in these phases represent one third of the total software cost.
Author (ESA)

N83-13850# Politecnico di Torino (Italy). Ist. di Electtronica e Telecomunicazioni.
PERFORMANCE EVALUATION AND MODULATION TECHNIQUES OF SIMULATED TELECOMMUNICATION SYSTEMS
M. Ajmone Marsan, S. Benedetto, E. Biglieri, V. Castellani, M. Elia, L. LoPresti, and M. Pent Paris ESA Apr. 1982 128 p refs
(Contract ESTEC-4450/80/NL-PP(SC))
(ESA-CR(P)-1628) Avail: NTIS HC A07/MF A01

The enhancement of the capabilities of an advanced time-domain simulation package called Topsim is reported. Topsim design goal was mainly to obtain a heavily user oriented language to deal with block diagrams of communication systems. The expansion of the user library and the possibility of using the same language during the simulation step and for the on-line and off-line measurements were considered. The simulator library is twice as large as it was in the first version, and the performance evaluation measures can be done easily both inside the simulation program or using simulation results previously obtained; in both cases the user must write the same program and this program is of the same type as the simulation program. Author (ESA)

N83-13851# SEMA (Metra International), Paris (France).
MODEL ANALYZER MANIP: PRELIMINARY SOFTWARE DEFINITION DOCUMENT, VOLUME 1
J. P. Eckly, J. M. Lacaille, and J. M. LeGlas Paris ESA Jan. 1982 147 p refs 2 Vol.
(Contract ESTEC-4676-81/NL-AK)
(SDD-MANIP-001-A-Vol-1; ESA-CR(P)-1629-Vol-1) Avail: NTIS HC A07/MF A01

A feasibility study of the model analyzer MANIP in the form of a software definition document is presented. The initial software requirement document was revised and the state of the art of computer aided design and data base design was investigated. A preliminary design of MANIP followed. It is concluded that an unrestricted MANIP system is not feasible within the present state of the art. A proposal for the structuration of a generalized model concept, and a preliminary architectural design of a restricted MANIP, with a particular focus on its model data base are presented. Author (ESA)

N83-13852# SEMA (Metra International), Paris (France).
MODEL ANALYZER MANIP: SOFTWARE REQUIREMENTS DOCUMENT, VOLUME 2
Paris ESA 11 Sep. 1981 71 p refs 2 Vol.
(Contract ESTEC-4676-81/NL-AK)
(SRD-MANIP-002-C-V0l-2; ESA-CR(P)-1629-Vol-2) Avail: NTIS HC A04/MF A01

The requirements of the MANIP program are described. The MANIP model analyzer system is designed to act as supervisor of the current and future applications software, using time saving techniques, notably computer-aided techniques, interactive communication techniques for data and result retrieval and interactive graphics. The description includes management, system and program requirements. Appendices on functional requirements, state of the art in data base design and state of the art in computer assisted design are also included. Author (ESA)

N83-13853# Stichting Mathematisch Centrum, Amsterdam (Netherlands).
DRAFT PROPOSAL FOR THE B PROGRAMMING LANGUAGE
Lambert G. L. T. Meertens 1981 90 p refs
(ISBN-90-6196-238-2) Avail: NTIS HC A05/MF A01

A programming language designed to be used on personal computers is described. It is a simple language but suitable for relatively complex applications such as game developing, bookkeeping, simple engineering computations or learning how to program. The description includes locations, units, commands, expressions, targets, tests and static checks. The syntax uses a VW grammar as in the ALGOL 68 revised report. Author (ESA)

N83-13854# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
INITIAL ALGEBRA SPECIFICATIONS FOR PARAMETERIZED DATA TYPES
J. A. Bergstra (Leiden Univ., Netherlands) and J. W. Klop Dec. 1981 23 p refs
(MC-IW-186/81) Avail: NTIS HC A02/MF A01

Parameterized data types phi: Alg (Sigma) tends to Alg (Delta) where phi is a partial functor from the class of all (Sigma) algebras (the parameter algebras) to the class of Delta algebras (the target algebras), for given signatures (Sigma), (Delta) with Delta extending Sigma. It is required that the target algebra be generated by a homomorphic image of the parameter algebra. For such parameterized data types, a general theorem about the existence of initial algebra specifications with conditional equations is proven. The theorem involves the concept of an effectively given parameterized data type. Author (ESA)

N83-13855# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
MIDL, A MICROINSTRUCTION DESCRIPTION LANGUAGE
Marleen Sint Dec. 1981 25 p refs Submitted for publication
(MC-IW-187/81) Avail: NTIS HC A02/MF A01

A MIDL description of a microarchitecture that defines the semantics and triggering conditions of all microoperations is introduced. It also defines operand selection. The MIDL incorporates a timing model that allows detailed specification of the timing of each microoperation. A sequencing model that allows the description of many different sequencing schemes is also included. Author (ESA)

N83-13856# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
DEFINITION OF AN ABSTRACT ALGOL 68 MACHINE
L. G. L. T. Meertens Dec. 1981 36 p refs
(MC-IW-188/81) Avail: NTIS HC A03/MF A01

A machine-independent abstract machine, the MIAM, whose code may serve as the target code for a portable ALGOL 68 compiler is defined. Implementing ALGOL 68 with the MIAM entails two steps: implementing ALGOL 68 in terms of the MIAM; and implementing the MIAM in terms of an actual computer. Only the core of the MIAM is discussed which is sufficient to model all

actions with regards to semantics (with the exception of the widening coercions and the denotations). Author (ESA)

N83-13857# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
STRUCTURED TEXT FORMATTING
H. Noot Feb. 1982 25 p refs Submitted for publication
(MC-IW-191/82) Avail: NTIS HC A02/MF A01

A document formatting system is presented which incorporates an elaborate error detection and recovery mechanism. Format directives are implemented by the user in a high level language instead of in low level macrolanguages generally used for this purpose. A systematic way of dealing with problems, e.g., the avoidance of widows, is discussed as well as a concatenation mechanism for two-dimensional strings. All major design decisions taken for this system are extensively motivated. Author (ESA)

N83-13858# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
FORMAL PROOF SYSTEMS FOR PROGRAM EQUIVALENCE
J. A. Bergstra (Leiden Univ., Netherlands) and J. W. Klop Mar. 1982 17 p refs Revised Submitted for publication
(MC-IW-194/82) Avail: NTIS HC A02/MF A01

Conservative refinements of specifications are explored. These form an appropriate framework for a proof theory for program equivalence that is based on a logic for partial program correctness. Two formalized proof methods for program equivalence (inclusion) are proposed. Both are sound with respect to the most general semantics of first order specifications. In spite of being incomplete, the methods cover many natural examples. Author (ESA)

N83-13859# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ON INFINITE COMPUTATIONS IN DENOTATIONAL SEMANTICS
J. W. deBakker, J.-J. C. Meyer (Free Univ., Amsterdam), and J. I. Zucker (Bar-Ilan Univ., Israel) Mar. 1982 38 p refs Submitted for publication
(MC-IW-196/82) Avail: NTIS HC A03/MF A01

Finite and, especially, infinite computations in languages with iteration or recursion are studied in the framework of denotational semantics. A theorem which relates their syntactic and semantic characterizations is proved. A general proof method is presented in order to establish this relation and it is shown how (in an induction on the structure of the syntactic constructs of the language) the recursive case follows from the nonrecursive one by applying a general definitional scheme. The method is applicable to a variety of other problems which concern recursive constructs, such as fixed point characterizations of several notions of weakest precondition. Also, connections with the theory of languages with infinite words are discussed, in particular, with a substitution theorem due to Nivat. Author (ESA)

N83-13860# General Accounting Office, Washington, D. C. Accounting and Financial Management Div.
IMPROVING COBOL APPLICATIONS CAN RECOVER SIGNIFICANT COMPUTER RESOURCES Report to the Congress
1 Apr. 1982 79 p refs
(PB82-198540; AFMD-82-4) Avail: NTIS HC A05/MF A01 CSCL 09B

The reduction of computer costs of Federal computer applications is discussed and a checklist is included to guide data processing managers in such work. GRA

N83-13861# Pennsylvania Univ., Philadelphia. Dept. of Decision Sciences.
ACCESS CONTROL LANGUAGE SYNTAX AND SEMANTICS Final Report
Eric K. Clemons, Steven Hanks, and Jon A. Pastor 1 Apr. 1982 45 p refs
(Contract NB80-SBCA-0527)
(PB82-227083; NS-GCR-82-370) Avail: NTIS HC A03/MF A01 CSCL 09B

A language to provide enhanced access control capabilities for network data base management systems is discussed. The architecture of a proposed access control facility is reviewed, and its language and interface requirements discussed. The functional requirements for the language are enumerated, and its syntax and semantics are described. Language facilities are provided for access control definition and update, and for inquiries concerning access privileges granted. The language is designed such that it may be used for initial definition, update, or query of access privileges, in either batch or interactive mode. The access control system proposed is at the schema level, rather than at the subschema level, and is stand-alone, rather than embedded in the schema definition processor. Finally, the facility is based on granting or denying rights to roles that may be occupied by one or more users, in contrast to the lock and key approach.
Author (GRA)

62 COMPUTER SYSTEMS

Includes computer networks.

N83-13862# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN OF A LOCAL COMPUTER NETWORK FOR THE ROBINS AIR FORCE BASE ELECTRONIC WARFARE DIVISION, ENGINEERING BRANCH LABORATORY M.S. Thesis
Robert H. Stokes Dec. 1981 454 p refs
(AD-A119253; AFIT/GCS-EE-81D-16) Avail: NTIS HC A20/MF A01 CSCL 09/2

A local computer for the Electronic Warfare Division Engineering Branch Laboratory was designed around a commercially available and supportable network configuration. The requirements for this network were specified by interviewing the engineers associated with the Engineering Branch Laboratory and then translating the functional requirements into a detailed set of hardware and software system requirements. Structured Analysis was used to produce a structured specification for application, transport, network, and data link protocol level requirements. These computers will be connected to the nodes using duplex fiber optic links supporting transmission rates up to 1 Mbs. The Phase II DECnet protocol was selected to provide the file transfer and data transport protocols in conjunction with a basic routing algorithm at each host, while the Phase III DECnet protocol was selected to provide these functions at a higher level in the nodes. The selection of the above topology in conjunction with the described protocol structure keeps any one host from degrading the network if the host should fail. GRA

N83-13863# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
ARRAY AND PARALLEL PROCESSORS IN ON-LINE COMPUTATIONS Final Report
Apr. 1982 77 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1355-2)
(DE82-903572; EPRI-EL-2363) Avail: NTIS HC A05/MF A01

This report presents a classification of parallel processors and discusses previous EPRI-sponsored work indicating that the array processor holds special promise for use in power systems simulation problems. Operating on this premise a complete ac power flow code was developed for the Floating Point Systems AP-120B array processor and its host computer. This optimized code will solve the IEEE standard 118-bus power flow in less than 2.5 ms. from a flat start and can be reasonably projected to solve a 1000-bus power flow in less than 0.5 second. Computational speed of this order allows problems such as on-line contingency studies to be solved. Up until now these solutions were inaccessible due to the expense of the equipment required. The performance of a parallel connection of several array processors has also been studied. The results show that a rather simple configuration of several processing elements resembling the AP-120B will operate with a speedup close to the number of processors involved. DOE

N83-13864# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
DYNAMIC NETWORKS OF PARALLEL PROCESSES
A. P. W. Boehm (Utrecht State Univ.) and A. deBruin Mar. 1982 43 p refs Submitted for publication
(MC-IW-192/82) Avail: NTIS HC A03/MF A01

A model of parallel computation that is based on Kahn's simple language for parallel programming, KAHN74, is investigated. The semantics, the dynamic model and the algorithms are discussed. Two sorting algorithms and a matrix multiplication algorithm are presented and proven correct. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N83-13865*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ADAPTIVE CONTROL IN THE PRESENCE OF UNMODELED DYNAMICS Ph.D. Thesis
Charles Edward Rohrs Nov. 1982 409 p refs Sponsored in part by E. I. DuPont deNemours and Co., Inc.
(Grants NGL-22-009-124; AF-AFOSR-3281-77)
(NASA-CR-169525; NAS 1.26:169525; LIDS-TH-1254) Avail: NTIS HC A18/MF A01 CSCL 09B

Stability and robustness properties of a wide class of adaptive control algorithms in the presence of unmodeled dynamics and output disturbances were investigated. The class of adaptive algorithms considered are those commonly referred to as model reference adaptive control algorithms, self-tuning controllers, and dead beat adaptive controllers, developed for both continuous-time systems and discrete-time systems. A unified analytical approach was developed to examine the class of existing adaptive algorithms. It was discovered that all existing algorithms contain an infinite gain operator in the dynamic system that defines command reference errors and parameter errors; it is argued that such an infinite gain operator appears to be generic to all adaptive algorithms, whether they exhibit explicit or implicit parameter identification. It is concluded that none of the adaptive algorithms considered can be used with confidence in a practical control system design, because instability will set in with a high probability. Author

N83-13866# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
CONTROLLED INVARIANCE BY STATIC OUTPUT FEEDBACK FOR NONLINEAR SYSTEMS
Henk Nijmeijer and Arjan vanderSchaft (Groningen Rijksuniv., Netherlands) Nov. 1981 17 p refs Submitted for publication
(MC-BW-151/81) Avail: NTIS HC A02/MF A01

The notion of static output feedback for nonlinear systems is dealt with. Necessary and sufficient conditions are derived for (C,A,B)-invariance, or measured controlled invariance, for nonlinear control systems. Author (ESA)

N83-13867# Sheffield Univ. (England). Dept. of Control Engineering.
CONTROL SYSTEMS DESIGN FOR UNCERTAIN DYNAMICAL SYSTEMS
D. H. Owens and A. Chotai May 1982 10 p refs
(Grant SRC-GR/B/23250)
(RR-189) Avail: NTIS HC A02/MF A01

The use of approximate plant models for computer-aided controller design for multivariable systems with uncertain or unknown dynamic model is considered. The techniques incorporate observed differences in plant/model time-response characteristics into the design process using graphical techniques similar to the inverse Nyquist array. The techniques were used to design loop controllers for a two input-two output liquid storage system and proportional controllers for a four input-four output boiler furnace system, using a diagonal approximate model. The loop control design is satisfactory, but the diagonal model produces a low gain controller for the furnace system. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-13868# New South Wales Univ., Kensington (Australia). Dept. of Physical Chemistry.
THE RACAH ALGEBRA FOR GROUPS WITH TIME REVERSAL SYMMETRY. PART 1: THEORY Ph.D. Thesis
Jan Dennis Newmarch 1981 159 p refs 2 Vol.
Avail: NTIS HC A08/MF A01

The aim of this thesis is to construct and determine the properties of the Racah algebra for compact groups of linear/anti-linear operators including the Wigner time reversal operator theta (the grey groups). This problem has a clear physical basis as for non-magnetic, paramagentic and diamagnetic crystals in chemistry, theta commutes with the Hamiltonian in the absence of an external magnetic field. Time reversal symmetry is also used in elementary particle physics. The use of a symmetry group for a quantum system can only be fully exploited by extensive use of Racah algebra methods, particularly the Wigner-Eckart theorem. Author

N83-13869# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NUMERICAL ANALYSIS OF INTERVALS AND ITS APPLICATION [ASPECTOS DA ANALISE NUMERICA DE INTERVALOS DO PONTO DE VISTA DE SUA UTILIZACAO]
Carlos Jose Zalmutti Jul. 1982 21 p refs In PORTUGUESE Presented at the 5th Natl. Congr. on Appl. and Computational Math., Joao Pessoa, Brazil, 1-5 Aug. 1982 Sponsored in part by the National Fund for Scientific and Technological Development
(INPE-2486-PRE/170) Avail: NTIS HC A02/MF A01

The analysis of confidence intervals is applied to the numerical solution of problems. Errors caused by uncertainties in numerical analysis are considered. A method based on the application of a generalized form of the Taylor theorem is applied. Computer time required for the use of this method is compared to that required for the application of the interval arithmetic method. Transl. by J.D.

N83-13870# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE PROBLEM OF INFORMATION RECOVERY IN THE USE OF RESIDUE ARITHMETIC [O PROBLEMA DE RECUPERACAO DA INFORMACAO NA UTILIZACAO DA ARITMETICA DE RESIDUOS]
Carlos Jose Zalmutti Jul. 1982 25 p refs In PORTUGUESE Submitted for publication
(INPE-2485-PRE/169) Avail: NTIS HC A02/MF A01

The Chinese theorem of residues is discussed from the point of view of information recovery. The application of the theorem is demonstrated by the association of a nonlinear vector space to whole numbers. Problems relative to the emphasis adopted are discussed and illustrative examples presented. Transl. by J.D.

N83-13871# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
METHODS OF IMAGE INTERPOLATION: PERFORMANCE EVALUATION [METODOS DE INTERPOLACAO EM IMAGENS: AVALIACAO DE DESEMPENHO]
Celso L. Mendes, Nelson D. A. Mascarenhas, and Ricardo C. M. Souza Jul. 1982 23 p refs In PORTUGUESE Presented at the 4th Conf. on Appl. and Computational Math., Rio de Janeiro, 8-11 Sep. 1981
(INPE-2475-PRE/163) Avail: NTIS HC A02/MF A01

A comparative evaluation of the performance of several image interpolation methods in both the space and frequency

domains is presented. Several B-spline functions, a linear function, sinc functions, approximation methods, and a histospline function are considered. Experimental results of the interpolation of test images are presented. Transl. by J.D.

N83-13872# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SUBOPTIMAL SOLUTIONS TO PROBLEMS OF THE CONTROL OF DYNAMIC SYSTEMS [SOLUCOES SUBOTIMAS DE PROBLEMAS DE CONTROLE DE SISTEMAS DINAMICOS]
Decio Castilho Ceballos Apr. 1982 6 p refs In PORTUGUESE Presented at the INPE-LCC Seminar, Rio de Janeiro, 25-27 Nov. 1981
(INPE-2380-PRE/105) Avail: NTIS HC A02/MF A01

Two methods for the suboptimal optimization of problems of the control of dynamic systems through the application of the Rayleigh-Ritz method are presented. In the first method, a linear norm and a linear expansion make possible the determination of the increments through the resolution of a linear programming problem. The other method applies optimal filtration procedures to solve a linear perturbation problem associated with each iteration. A stochastic interpretation of the criteria of convergence and of two errors introduced by the linear approximation make possible the determination of the increments. Transl. by J.D.

N83-13873*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
GP-B ERROR MODELING AND ANALYSIS Annual Report, 24 Jun. 1981 - 31 Aug. 1982
James C. Hung 30 Sep. 1982 63 p refs
(Contract NAS8-34426)
(NASA-CR-170672; NAS 1.26:170672) Avail: NTIS HC A04/MF A01 CSCL 12A

Individual source errors and their effects on the accuracy of the Gravity Probe B (GP-B) experiment were investigated. Emphasis was placed on: (1) the refinement of source error identification and classifications of error according to their physical nature; (2) error analysis for the GP-B data processing; and (3) measurement geometry for the experiment. M.G.

N83-13874# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
A TWO-PARAMETER CLASS OF BESSEL WEIGHTINGS WITH CONTROLLABLE SIDELOBE BEHAVIOR FOR LINEAR, PLANAR-CIRCULAR, AND VOLUMETRIC-SPHERICAL ARRAYS; THE IDEAL WEIGHTING-PATTERN PAIRS
Albert H. Nuttall 1 Jul. 1982 86 p refs
(NUSC Proj. A75205; ZR0000101)
(AD-A119142; NUSC-TR-6761) Avail: NTIS HC A05/MF A01 CSCL 12/1

A two-parameter class of Bessel weightings is presented whose patterns have controllable sidelobe decay and mainlobe-to-peak-sidelobe ratio, for one-two-, and three dimensional arrays. In the one dimensional application, the class of weightings subsumes the Kaiser-Bessel weighting as a special case, and extends to the ideal van der Maas weighting as a limiting case. In the two-and three dimensional applications, all the results are new; the ideal patterns in these latter cases are also derived and found to require weightings with generalized functions that are more singular than the delta functions required for one dimension. Approximations to the generalized functions are presented. Author (GRA)

N83-13875# Oak Ridge National Lab., Tenn.
TRIANGLE-BASED C(1) INTERPOLATION METHOD
R. J. Renka May 1982 46 p refs
(Contract W-7405-eng-26)
(DE82-014572; ORNL/CSD-103) Avail: NTIS HC A03/MF A01

Methods and software for C(1) interpolation of arbitrarily distributed data points in the plane are discussed. The primary result presented is a derivative estimation procedure which leads to interpolatory surfaces constituting very accurate approximations for a variety of test functions. DOE

N83-13876# Bendix Corp., Kansas City, Mo.
FINITE-ELEMENT-METHOD EVALUATION Final Report
W. C. Rutherford Aug. 1982 14 p refs
(Contract DE-AC04-76DP-00613)
(DE82-019517; BDX-613-2813) Avail: NTIS HC A02/MF A01

A two-dimensional finite element method software package was implemented for static analysis and heat transfer analysis of axisymmetric and plane solids. A powerful three-dimensional finite element package was implemented but only a small number of the possible applications were investigated. These basic finite element capabilities provide analysis tools for a limited class of potential application problems. These capabilities will be expanded to cover a much wider class of application problems. DOE

N83-13877# Laboratory for Electronic Development of the Armed Forces, Oegstgeest (Netherlands).
TARGET MOTION ANALYSIS (TMA) WITH AN EXTENDED KALMAN FILTER USING BEARING AND FREQUENCY MEASUREMENTS
M. W. Ockeloen and G. A. Willemsen 27 May 1982 35 p refs In DUTCH; ENGLISH summary
(Contract A78/KM/102)
(LEOK-TR-1982-02; TDCK-76717) Avail: NTIS HC A03/MF A01

A Kalman filter for target motion analysis is described. The filter can process random combinations of bearing, range, course, speed and frequency measurements. In applications, such as passive sonar tracking, only bearing and frequency measurements are available. A simulation program shows that adding frequency measurements, provided the source frequency is stable, adds considerably to the performance of the filter compared to a bearing-only mode. Author (ESA)

N83-13878# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
LATTICES AND FACTORIZATION OF POLYNOMIALS
A. K. Lenstra Dec. 1981 26 p refs Submitted for publication
(MC-IW-190/81) Avail: NTIS HC A03/MF A01

An algorithm to factorize polynomials over an algebraic number field is presented. Unlike other algorithms, the efficiency of the method does not depend on the irreducibility of the minimal polynomial modulo some prime. The algorithm is based on a theorem on integral lattices and a lower bound for the length of a polynomial having modulo p to the k-th power a nontrivial common divisor with the minimal polynomial. These theorems also make it possible to formulate an algorithm for factoring polynomials over the integers. Author (ESA)

N83-13879# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
FACTORING POLYNOMIALS WITH RATIONAL COEFFICIENTS
A. K. Lenstra, H. W. Lenstra (Amsterdam Univ.), and L. Lovasz (A. Jozsef Univ., Hungary) Mar. 1982 33 p refs Submitted for publication
(MC-IW-195/82) Avail: NTIS HC A03/MF A01

A polynomial-time algorithm for the factorization of polynomials in one variable with rational coefficients is described. First a suitable small prime number p is found, a p-adic irreducible factor h of the polynomial f. This is done with Berlekamp's algorithm for factoring polynomials over small finite fields, combined with Henrel's lemma. Then the irreducible factor h sub zero of F in Z that is divisible by h is looked for. This factor belongs to a certain lattice, and the condition that it divides F implies that the coefficients of h sub zero are relatively small. It follows that a small element in that lattice can be found by means of a base reduction algorithm. This is used to determine h sub zero. The algorithm is repeated until all irreducible factors of f are found. Formulas determining the number of arithmetic operations required by the algorithm and the length of the integers on which these operations are performed are proved. Author (ESA)

N83-13880# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
AN ACCURATE METHOD WITHOUT DIRECTIONAL BIAS FOR

THE NUMERICAL SOLUTION OF A TWO DIMENSIONAL ELLIPTIC SINGULAR PERTURBATION PROBLEM
P. W. Hemker Dec. 1981 18 p refs Submitted for publication
(MC-NW-117/81) Avail: NTIS HC A02/MF A01

A method which makes use of the defect correction principle is described. One defect correction step uses both an accurate instable and an inaccurate stable discretization of the continuous problem (finite element method discritization and artificial diffusion). A second defect correction step is a relaxation or smoothing step. In the combined process, both steps iteratively alternate. The iteration can easily be incorporated in an iterative algorithm for the solution of the discretized system, e.g., a multiple grid method. Without a directional bias in the discretizations and without particular mesh refinements, the resulting method is asymptotically stable. It is O (h squared) accurate for smooth components in the solution and the numerical boundary layer thickness is 0 (h). The method is suited for locating the boundary layer and for subsequent application of adaptive mesh-refinements. Author (ESA)

N83-13881# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
VOLTERRA INTEGRAL EQUATIONS OF THE SECOND KIND WITH NONSMOOTH SOLUTIONS: HIGH-ORDER METHODS BASED ON COLLOCATION TECHNIQUES
H. Brunner (Fribourg Univ., Switzerland) and H. J. J. teRiele Jan. 1982 23 p refs Submitted for publication
(MC-NW-118/82) Avail: NTIS HC A02/MF A01

Methods with arbitrary order of convergence are derived for the approximate solution of second kind Volterra integral equations with weakly singular kernels where exact solutions have unbounded derivatives at the left endpoint of the interval of integration. These methods are based on collocation techniques in certain nonsmooth piecewise function spaces whose elements reflect the singular behavior of the given equation. Author (ESA)

N83-13882# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
TWO-STEP SPLITTING METHODS FOR SEMIDISCRETE SECOND ORDER HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS
H. B. deVries Jan. 1982 29 p refs
(MC-NW-120/82) Avail: NTIS HC A03/MF A01

Splitting methods are studied for a certain class of second order hyperbolic partial differential equations. The method of lines and, in particular, the time integration are discussed. A class of two-step integration formulas is defined which contains several well-known splitting methods. The first and second order two-step splitting methods are unconditionally stable for a model problem. Numerical experiments are described. Author (ESA)

N83-13883# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE ZEROS OF THE RIEMANN ZETA FUNCTION IN THE CRITICAL STRIP, 2
R. P. Brent (Australian National Univ., Canberra), J. vandeLune, H. J. J. teRiele, and D. T. Winter Jan. 1982 15 p refs Submitted for publication
(MC-NW-121/82; TR-CS-82-01) Avail: NTIS HC A02/MF A01

Computations are extensively described, which show that Riemann's zeta function has exactly 200,000,001 zeros of the form (rho + it) in the region $0 < t < 81,702,130.19$; all these zeros are simple and lie on the line rho = 1/2. This extends a similar result for the first 81,000,001 zeros, established in a previous report. Counts of the number of Gram blocks of various types and the failures of Rosser's rule are given. Author (ESA)

N83-13884# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
CONTRACTIVITY OF LOCALLY ONE DIMENSIONAL SPLITTING METHODS
J. G. Verwer Mar. 1982 20 p refs Submitted for publication
(MC-NW-124/82) Avail: NTIS HC A02/MF A01

Contractivity properties of two locally one-dimensional splitting methods for nonlinear, multispace dimensional, parabolic partial differential equations are studied. The term contractivity means that perturbations do not propagate in the course of the time integration process. By relating the locally one-dimensional methods with contractive integration formulas for ordinary differential systems, it is shown that the splitting methods define contractive numerical solutions for a large class of nonlinear parabolic problems without restrictions on the size of the time step. Author (ESA)

N83-13885# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A CLASS OF RUNGE-KUTTA-ROSENBROCK METHODS FOR SOLVING STIFF DIFFERENTIAL EQUATIONS
J. G. Verwer, S. Scholz (Tech. Hochschule, Dresden), J. G. Blom, and M. Louter-Nool Mar. 1982 22 p refs Submitted for publication
(MC-NW-125/82) Avail: NTIS HC A02/MF A01

A class of Runge-Kutta-Rosenbrock methods is discussed for the numerical solution of the initial value problem for stiff systems of ordinary differential equations. Special attention is payed to the use of time-lagged Jacobian matrices. The aim is to obtain an appreciable reduction in the number of Jacobian matrix evaluations and related matrix factorizations. When dealing with large systems the costs of these computations normally form a large proportion of the total integration costs of the Rosenbrock method. Author (ESA)

N83-13886# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
RULES FOR CONSTRUCTING HYPERPERFECT NUMBERS
H. J. J. teRiele Apr. 1982 14 p refs Submitted for publication
(MC-NW-127/82) Avail: NTIS HC A02/MF A01

Two rules are given by which hyperperfect numbers (HP's) with k+2 different prime factors can be constructed from certain related numbers with k+1 and with k different prime factors, respectively. By means of these rules many HP's with three and with four, and one with five different prime factors were constructively computed. It is proved that all HP's (below a given bound) can be found with one of these two rules or with an additional rule for the construction of certain HP's. Results are presented of an exhaustive search for all HP's $<$ or $=$ 100 million. It is concluded that all the HP's found could also have been computed (but using much less computer time) with at least one of the given rules. A generalization of HP's to hypercycles is described. Author (ESA)

N83-13887# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
A SYNOPSIS OF KNOWN DISTANCE-REGULAR GRAPHS WITH LARGE DIAMETERS
Arjeh M. Cohen Nov. 1982 33 p refs
(MC-ZW-168/81) Avail: NTIS HC A03/MF A01

The known series of distance-regular graphs in which the diameter occurs as a parameter are reviewed. Author (ESA)

N83-13888# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
EXCEPTIONAL PRESENTATIONS OF THREE GENERALIZED HEXAGONS OF ORDER 2
Arjeh M. Cohen Dec. 1981 15 p refs Submitted for publication
(MC-ZW-169/81) Avail: NTIS HC A02/MF A01

Exceptional presentations of the generalized hexagon of order (2,1) on 21 points in the complex projective plane and of the dual of the classical generalized hexagon of order (2,2) on 63 points in the quaternionic projective plane are recalled. A third presentation of this kind is described, namely that of the (unique) generalized hexagon of order (2,8) on 819 points in the octonionic projective plane. The construction that is employed leads to an embedding of the finite group of Lie type (3)D sub 4 (2) in the Lie group of type F sub 4 (the set of all real numbers). Author (ESA)

N83-13889# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON THE VALUES OF A FUNCTION RELATED TO EULER'S GAMMA FUNCTION
J. vandeLune and M. Voorhoeve Dec. 1981 12 p refs
(MC-ZW-170/81) Avail: NTIS HC A02/MF A01

It is shown that the meromorphic function beta (s) : = the sum (n = zero to infinity) of (-1) to the n-th power/ (s + n) assumes every complex value infinitely many times. Author (ESA)

N83-13890# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
A FURTHER GENERALIZATION OF KRALL'S JACOBI TYPE POLYNOMIALS
T. H. Koornwinder Mar. 1982 13 p refs Submitted for publication
(MC-ZW-171/82) Avail: NTIS HC A02/MF A01

Orthogonal polynomials for which the weight function is a linear combination of the Jacobi weight function and two delta functions at 1 and -1 are studied. These polynomials can be expressed as hypergeometric functions and they satisfy second order differential equations. They include Krall's Jacobi type polynomials as special cases. The fourth order differential equation for the latter polynomials is derived in a simpler way.Author (ESA)

N83-13891# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON REGULAR NEAR POLYGONS
A. E. Brouwer and H. A. Wilbrink Apr. 1982 37 p refs Submitted for publication
(MC-ZW-173/82) Avail: NTIS HC A03/MF A01

A structure theory for regular near 2d-gons is developed. Main results are the existence of sub 2j-gons for 2 < or = j < or = d and the nonexistence of sporadic 2d-gons for d > or = 4 with s > 1 and t sub 2 > 1 and t sub 3 not equal to t sub 2 ((t sub 2) + 1). Author (ESA)

N83-13892# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
VARIATIONAL ANALYSIS OF A PERTURBED FREE BOUNDARY PROBLEM
O. Diekmann and D. Hilhorst Nov. 1981 34 p refs Submitted for publication
(MC-TW-220/81) Avail: NTIS HC A03/MF A01

The solution u sub epsilon of a nonlinear boundary value problem (dependent on a parameter epsilon) is shown to converge to a limit u sub zero as epsilon decreases to zero. The limit, u sub zero, is characterized as the solution of a free boundary problem and its properties are discussed. Author (ESA)

N83-13893# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
SINGULAR PERTURBATIONS AND A MAPPING ON AN INTERVAL FOR THE FORCED VAN DER POL RELAXATION OSCILLATOR
J. Grasman, H. Nijmeijer, and E. J. M. Veling Mar. 1982 32 p refs Submitted for publication
(MC-TW-221/82) Avail: NTIS HC A03/MF A01

The Van der Pol relaxation oscillator with a large sinusoidal forcing term is discussed. By using singular perturbation techniques, asymptotic solutions of such a system are constructed. These asymptotic approximations are locally valid and take the form of a two time scale expansion in one region and a boundary layer type of solution in the next region. Integration constants are determined by averaging and matching conditions. From these local solutions, a difference equation is constructed. There is an equivalence between solutions of the difference equation, which is an integrated mapping on a compact interval and solutions of the system itself. This equivalence makes it possible to analyze subharmonics and chaotic type solutions to the full extent. Domains in the parameter space where regular subharmonics exist are found. These domains overlap so that for some parameter values, different subharmonics coexist. For the same values, chaotic type solutions are found and are described by using concepts of symbolic dynamics. Author (ESA)

N83-13894# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
A SEMI-INFINITE TRUMPET-SHAPED MODEL OF THE COCHLEA
R. deBruin Nov. 1981 17 p refs
(MC-TW-222/81) Avail: NTIS HC A02/MF A01

A semi-infinite trumpet-shaped model of the cochlea is presented. By means of conformal mapping and other general techniques of complex variables, an asymptotic solution is obtained. The result correctly shows well-known effects as appear in other known mathematical models. An asymptotic solution is given as the radius of the trumpet vanishes. Author (ESA)

N83-13895# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
FOURIER INTEGRALS OF SERIES OF BESSEL FUNCTIONS ARISING IN THE THEORY OF RESIDUAL CURRENTS IN TIDAL AREAS
N. N. Temme May 1982 15 p refs
(MC-TW-223/82) Avail: NTIS HC A02/MF A01

Fourier transforms of series of Bessel functions which arise in the theory of residual currents in tidal areas are considered. The integrals are evaluated by writing them in terms of Legendre functions. The series are expressible in these functions, too. Author (ESA)

N83-13896# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
OBSERVABILITY OF A CLASS OF NONLINEAR SYSTEMS: A GEOMETRIC APPROACH
Henk Nijmeijer Feb. 1982 22 p refs Submitted for publication
(MC-BW-154/82) Avail: NTIS HC A02/MF A01

The observability of nonlinear systems was studied using involutive distributions as building blocks. Since these distributions are the nonlinear equivalents of linear subspaces of a given linear space, the method mimics the geometric approach to linear multivariable systems. Based on a set of invariants, a local canonical form for a locally weakly observable system without inputs is derived. A class of nonlinear control systems is introduced for which this set of invariants is unaffected by an arbitrary input function. Author (ESA)

N83-13897# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
A BERRY-ESSEEN THEOREM FOR FUNCTIONS OF UNIFORM SPACINGS
Ronald J. M. M. Does (Limburg Univ., Netherlands) and Chris A. J. Klaassen Sep. 1981 19 p refs Submitted for publication
(MC-SW-76/81) Avail: NTIS HC A02/MF A01

A Berry-Esseen bound of order omicron (sq root N) is established for suitably normalized sums of nonlinear functions of uniform spacings under a natural moment assumption and mild regularity conditions. Furthermore, it is shown that these regularity conditions are fulfilled for a wide class of functions. Author (ESA)

N83-13898# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ORDERING PROPERTIES IN CORRESPONDENCE ANALYSIS
B. F. Schriever Feb. 1982 31 p refs Submitted for publication
(MC-SW-80/82) Avail: NTIS HC A03/MF A01

Strong forms of bivariate dependence, which can be interpreted as order relations, are considered. It is proved that, under quite general conditions, such order relations if present in frequency tables are preserved by correspondence analysis. Models for frequency tables having these strong forms of dependence are given. The results are obtained by using total positivity theory. Author (ESA)

N83-13899# Manchester Coll. of Science and Technology (England). Control Systems Centre.
A GENERAL SOLUTION TO THE SYSTEM IDENTIFICATION

PROBLEM USING INTERMEDIATE DOMAIN PROCESSING
Barry Dwolatsky Oct. 1981 25 p refs
(PB82-220955; Control-Systems-Centre-508) Avail: NTIS HC A02/MF A01 CSCL 12A

A general theory of translation-invariant linear systems is outlined. By making specific choices within this general framework, different special cases can be derived. A method is developed which facilitates the conversion between data vectors associated with each of these special cases. This conversion technique is used in deriving a generalized solution to the system identification problem. A practically useful example is considered in which the unknown system is assumed to be time-invariant linear, whereas computations are caried out in the domain of an equivalent and computationally advantageous dyadic-invariant linear system. GRA

N83-13900# Manchester Coll. of Science and Technology (England). Control Systems Centre.
A COMPARISON BETWEEN THE METHOD OF INEQUALITIES AND OTHER TECHNIQUES IN CONTROL SYSTEMS DESIGN
A. M. Dahshan May 1981 11 p refs
(PB82-221045; Control-Systems-Centre-493) Avail: NTIS HC A02/MF A01 CSCL 12A

The linear-quadratic method is compared with the method of inequalities in connection with the design of feedback controllers for conditionally linear plants. It is concluded that the method of inequalities is the only known practical method for tracking such problems. Author (GRA)

N83-13901# Manchester Univ. (England). Control Systems Centre.
DISCRETE TWO-TIME-SCALE SYSTEMS
Magdi S. Mahmoud, Yuliu Chen (Tsinghua Univ.), and Madan G. Singh Dec. 1980 24 p refs
(PB82-221086; Control-Systems-Centre-497) Avail: NTIS HC A02/MF A01 CSCL 12A

Reduced-order modelling and control analysis of linear, discrete-time systems possessing fast and slow modes are presented. A matrix norm condition is derived, the satisfaction of which quarantees that the cluster of large eigenvalues is separated from the cluster of small eigenvalues. Design of stabilizing feedback controllers is developed and it is shown that two gain matrices are needed for separate assignments of desired small and large eigenvalues. Control system examples are worked out to illustrate the theoretical developments. Author (GRA)

N83-13902# Manchester Univ. (England). Control Systems Centre.
STRUCTURAL PROPERTIES OF DISCRETE SYSTEMS WITH SLOW AND FAST MODES
Magdi S. Mahmoud Feb. 1981 20 p refs
(PB82-223025; Control-Systems-Center-505) Avail: NTIS HC A02/MF A01 CSCL 12A

Structural properties of linear, discrete control systems with slow and fast modes are investigated. The time-scale separation is expressed in terms of a matrix norm condition. It is shown that the asymptotic stability and controllability properties of the discrete two-time-scale systems are deduced from the corresponding properties of two appropriately defined lower-order systems. The controllability invariance of the slow subsystem due to a class of fast feedback controls is demonstrated. A lower-order feedback control is derived to stabilize the original discrete system and the theoretical analysis is illustrated by a fifth-order power system model. Author (GRA)

N83-13903# Manchester Univ. (England). Control Systems Centre.
INFORMATION STRUCTURES IN DETERMINISTIC DECENTRALIZED CONTROL PROBLEMS
R. H. Li (Sian Jaitong Univ.) and M. G. Singh 1981 18 p refs
(PB82-223033; Control-Systems-Center-504) Avail: NTIS HC A02/MF A01 CSCL 12A

The information structures associated with deterministic decentralized control are examined. Conditions are derived under which such structures are partially nested. The tuning regulator approach and the sequential optimization approach are used as examples to examine these conditions in the context of concrete decentralized controller design philosophies. Author (GRA)

N83-13904# Manchester Univ. (England). Control Systems Centre.
ALTERNATIVES IN THE DESIGN OF CONTROL SYSTEMS BY THE METHOD OF INEQUALITIES
Abdalla M. Dahshan Feb. 1981 9 p refs Submitted for publication
(PB82-223041; Control-Systems-Centre-503) Avail: NTIS HC A02/MF A01 CSCL 12A

A numerical example is used to illustrate the effect of choosing different performance functionals and controller structure when designing control systems by the method of inequalities. Author (GRA)

N83-13905# Manchester Univ. (England). Control Systems Centre.
CONSTRUCTION OF STABLE INVERSES FOR LINEAR SYSTEMS
R. V. Patel Jan. 1982 30 p refs
(PB82-223058; Control-Systems-Centre-502) Avail: NTIS HC A03/MF A01 CSCL 12A

The problem of constructing stable (right) inverses for linear, time variant, multivariable systems is studied, using the structure algorithm of Silverman. It is shown how the structure algorithm can be used to determine the poles of an inverse which are 'invariant', i.e., common to all structure algorithm then enable one to construct inverses for which the remaining poles can be specified arbitrarily, so that, if the invariant poles are all stable, one can then construct stable inverses using the structure algorithm with appropriate modifications. Examples are given to illustrate the main results. Author (GRA)

N83-13906# Manchester Coll. of Science and Technology (England). Control Systems Centre.
APPLICATION OF THE METHOD OF INEQUALITIES TO THE CONTROL DESIGN OF SYSTEMS WITH DEAD-TIME
Abdalla M. Dahshan and Magdi S. Mahmoud Dec. 1980 26 p refs
(PB82-223074; Control-Systems-Centre-500) Avail: NTIS HC A03/MF A01 CSCL 12A

The design of controllers for continuous systems with dead time is discussed. Four design methods are considered and applied to first and second order systems. It is shown that the method of inequalities provides flexible controllers featuring satisfactory performance. The effect of load disturbance is examined and it is found that the method of inequalities ensures a sufficiently well-damped control system. Author (GRA)

N83-13907# Cambridge Univ. (England). Dept. of Engineering.
A SURFACE PATCH BOUNDED BY HELICAL LINES OF CURVATURE
J. J. DePont 1982 41 p refs
(PB82-277059; CUED/F-CAMS/TR-224-1982) Avail: NTIS HC A03/MF A01 CSCL 12A

The usual computer aided design approach to designing doubly curved surfaces is to build the surface up by stitching together elements of the surface called patches. Through the use of quaternions it was possible to set up the frame and position matching equations for a patch bounded by helical arc lines of curvature. However, although these equations are similar in structure to the cyclide equations and, in fact, reduce to them if all torsions are set to zero, an algebraic solution (as in the cyclide case) could not be found. Thus it became necessary to solve numerically a system of six nonlinear equations. A computer program based on Newton's method was developed to solve these equations, and, although not foolproof, it was able to solve most patches. The major finding of solving patches was that a patch with helical boundaries could not be sub-divided into patches with helical boundaries. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-13908*# Old Dominion Univ., Norfolk, Va.
CURVE FITTING AND MODELING WITH SPLINES USING STATISTICAL VARIABLE SELECTION TECHNIQUES
Patricia L. Smith Hampton, Va. NASA. Langley Research Center Nov. 1982 82 p refs
(Grant NAG1-223)
(NASA-CR-166034; NAS 1.26:166034) Avail: NTIS HC A05/MF A01 CSCL 12A

The successful application of statistical variable selection techniques to fit splines is demonstrated. Major emphasis is given to knot selection, but order determination is also discussed. Two FORTRAN backward elimination programs, using the B-spline basis, were developed. The program for knot elimination is compared in detail with two other spline-fitting methods and several statistical software packages. An example is also given for the two-variable case using a tensor product basis, with a theoretical discussion of the difficulties of their use. M.G.

N83-13909# Texas Univ., Austin. Applied Research Labs.
PREPRINTS RESULTING FROM WORK UNDER SBO 106: NON-GAUSSIAN SIGNAL PROCESSING
Patrick L. Brokett 2 Aug. 1982 140 p refs
(Contract N00014-81-K-0145)
(AD-A119103; ARL-TP-82-29) Avail: NTIS HC A07/MF A01 CSCL 12/1

Contents: The Likelihood Ratio Detector for Non-Gaussian Infinitely Divisible and Linear Stochastic Processes; The Equivalence of Weak, Strong and Complete Convergence in L1 for Kernel Density Estimates; On the Inconsistency of Bayesian Non-Parametric Estimators in Competing Risks/Multiple Decrement Models; When Does the Beta-th Percentile Residual Life Function Determine the Distribution; Variational Sums and Generalized Linear Processes; Identifiability for Dependent Multiple Decrement/Competing Risk Models; The Underwriting Risk and Return Paradox Revisited; Density Estimates of Surface and Bottom Reverberation. GRA

N83-13910# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
SIMPLE DEPENDENT PAIRS OF EXPONENTIAL AND UNIFORM RANDOM VARIABLES
A. J. Lawrence and P. A. W. Lewis (Birmingham Univ.) Mar. 1982 39 p refs
(AD-A119336; NPS55-82-011) Avail: NTIS HC A03/MF A01 CSCL 12/1

A random-coefficient linear function of two independent exponential variables yielding a third exponential variable is used in the construction of simple, dependent pairs of exponential variables. By employing antithetic exponential variables, the constructions are developed to encompass negative dependency. By employing negative exponentiation, the constructions yield simple multiplicative-based models for dependent uniform pairs. The ranges of dependency allowable in the models are assessed by correlation calculations, both of the product moment and Spearman types; broad ranges within the theoretically allowable ranges are found. Because of their simplicity, all models are particularly suitable for simulation and are free of point and line concentrations of values. GRA

N83-13911# Stanford Univ., Calif. Dept. of Operations Research.
REGENERATIVE SIMULATION OF HARRIS RECURRENT MARKOV CHAINS
Peter W. Glynn Jul. 1982 50 p refs
(Contract N00014-76-C-0578; Grant NSF MCS-79-09139)
(AD-A119251; TR-62) Avail: NTIS HC A03/MF A01 CSCL 12/1

If the steady-state simulation problem associated with a general discrete-event simulation is well-posed, then the corresponding Markov chain is Harris recurrent. For Harris chains, it is possible to develop a simulation methodology, closely related to the regenerative method, for obtaining confidence intervals associated with estimation of steady-state parameters. The passage-time problem for Harris chains is also studied, and an estimation approach for the steady-state simulation problem is outlined. Finally, it is shown that a certain family of nonlinear storage processes is Harris recurrent--the family provides an example of a Harris chain for which the classical regenerative method is inapplicable. Author (GRA)

N83-13912# Naval Postgraduate School, Monterey, Calif.
THE OPTIMAL SEARCH FOR A MOVING TARGET WHEN THE SEARCH PATH IS CONSTRAINED
James N. Eagle Aug. 1982 20 p refs
(AD-A119346; NPS55-82-020) Avail: NTIS HC A02/MF A01 CSCL 17/8

A search is conducted for a target moving in discrete time between a finite number of cells according to a known Markov process. The set of cells available for search in a given time period is a function of the cell searched in the previous time period. The problem is formulated and solved as a partially observable Markov decision process (POMDP). A finite time horizon POMDP solution technique is presented which is simpler than the standard linear programming methods. Author (GRA)

N83-13913# Stanford Univ., Calif. Dept. of Statistics.
A ROBUST ALTERNATIVE TO THE NORMAL DISTRIBUTION
D. L. McLeish 7 Jul. 1982 34 p refs
(Contract N00014-76-C-0475)
(AD-A119378; SU-TR-321) Avail: NTIS HC A03/MF A01 CSCL 12/1

A wider tailed family of distributions is suggested as an alternative to the normal distribution having many of the desirable properties of the normal family. One advantage of this alternative is the greater robustness of maximum likelihood estimates.
Author (GRA)

N83-13914# Stanford Univ., Calif. Dept. of Statistics.
SEQUENTIAL ANALYSIS OF THE PROPORTIONAL HAZARDS MODEL
T. Sellke and D. Siegmund Jul. 1982 28 p refs
(Contract N00014-77-C-0306; Grant NSF MCS-80-24649; NR Proj. 042-373)
(AD-A119375; TR-19; TR-191) Avail: NTIS HC A03/MF A01 CSCL 12/1

For the proportional hazards model of survival analysis, an appropriate large sample theory is developed for cases of staggered entry and sequential analysis. The principal techniques involve an approximation of the score process by a suitable martingale and a random rescaling of time based on the observed Fisher information. As a result we show that the maximum partial likelihood estimator behaves asymptotically like Brownian motion.
Author (GRA)

N83-13915# Stanford Univ., Calif. Dept. of Statistics.
FIXED ACCURACY ESTIMATION OF AN AUTOREGRESSIVE PARAMETER
T. L. Lai (Columbia Univ.) and D. Siegmund May 1982 21 p refs
(Contract N00014-77-C-0306; Grant NSF MCS-80-24649; NR Proj. 042-373)
(AD-A119373; SU-TR-16; SU-TR-189) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a first order non-explosive autoregressive process with unknown parameter beta epsilon (1,1), it is shown that if data are collected according to a particular stopping rule, the least squares estimator of beta is asymptotically normally distributed uniformly in beta. In the case of normal residuals, the stopping rule may be interpreted as sampling until the observed Fisher information reaches a preassigned level. The situation is contrasted with the

fixed sample size case, where the estimator has a non-normal limiting distribution when (beta) = 1. Author (GRA)

N83-13916# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
THE WEAK AND STRONG GAUSSIAN PROBABILISTIC REALIZATION PROBLEM
C. vanPutten and J. H. vanSchuppen Oct. 1981 25 p refs Submitted for publication
(MC-BW-149/81) Avail: NTIS HC A02/MF A01

A classification is given of all sigma-algebras that makes two given sigma-algebras conditionally independent in the case that the sigma-algebras are generated by finite dimensional Gaussian random variables. A classification is also given of all Gaussian measures that have the conditional independence property such that, restricted to a subspace, they coincide with a given measure. Author (ESA)

N83-13917# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
APPROXIMATIONS FOR (s, S) INVENTORY SYSTEMS WITH STOCHASTIC LEAD TIMES AND A SERVICE LEVEL CONSTRAINT
H. C. Tijms (Vrije Univ., Amsterdam) and H. Groenevelt (Vrije Univ., Amsterdam) Dec. 1981 21 p refs Submitted for publication
(MC-BW-152/81) Avail: NTIS HC A02/MF A01

The periodic review (s,S) inventory system with stochastic lead times and backlogging of excess demand is considered. A service level constraint is imposed on the fraction of demands that is backlogged. For given value of S-s, the reorder point s is determined such that the service constraint is satisfied. Approximations for the reorder point s are obtained by a simple and direct approach that also applies to both the periodic review lost-sales (s,S) inventory system and the continuous review (s,S) inventory system with stochastic lead times. A normal approximation, using only the first two moments of the total demand in the lead time plus review time, is presented. Numerical investigation shows that the normal approximations yield excellent results for the service level when the coefficient of variation of the demand in the lead time plus review time does not exceed 0.5, otherwise good approximations can be obtained when gamma densities are fitted to the demand densities by matching the first two moments. Author (ESA)

N83-13918# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
COX'S REGRESSION MODEL FOR COUNTING PROCESSES: A LARGE SAMPLE STUDY
P. K. Andersen (Dan. Med. and Social Sci. Res. Councils) and R. D. Gill Jul. 1981 41 p refs Submitted for publication
(MC-SW-73/81) Avail: NTIS HC A03/MF A01

The Cox regression model for censored survival data, which specifies that covariates have a proportional effect on the hazard function of the lifetime distribution of an individual, is extended to a model where covariate processes have a proportional effect on the intensity process of a multivariate counting process. This permits a statistical regression analysis of the intensity of a recurrent event allowing for complicated censoring patterns and time dependent covariates. Furthermore, this formulation gives proofs with very simple structure using martingale techniques for the asymptotic properties of the estimators from such a model. An example of a statistical analysis is included. Author (ESA)

N83-13919# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
LARGE SAMPLE BEHAVIOR OF THE PRODUCT LIMIT ESTIMATOR ON THE WHOLE LINE
Richard D. Gill Aug. 1981 24 p refs Submitted for publication
(MC-SW-74/81) Avail: NTIS HC A02/MF A01

Weak convergence results are proved for the product-limit estimator on the whole line. Applications are given to confidence band construction, estimation of mean lifetime, and to the theory of q-functions. The results are obtained using stochastic calculus and probability linear bounds for empirical processes. Author (ESA)

N83-13920# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
THE BERRY-ESSEEN BOUND FOR U-STATISTICS
R. Helmers and W. R. vanZwet (Leiden Univ., Netherlands) Sep. 1981 17 p refs Submitted for publication
(MC-SW-75/81) Avail: NTIS HC A02/MF A01

Further generality is given to the statement that the distribution function of a standardized U-statistic tends to its normal limit at the rate sq root of N. After stating and proving the Berren-Esseen theorem it is shown that the moment assumption can be relaxed even further. The result is extended to Von Mises functionals and an example concerning the Student's t is given. The resulting bounds are compared with those given by previous methods to quantify the extent of the improvement. Author (ESA)

N83-13921# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
BAYES TESTS FOR LOCALLY ASYMPTOTICALLY NORMAL FAMILIES
Donald R. Truax (Oregon Univ.) Oct. 1981 24 p refs Submitted for publication
(Grant NSF MCS-8002754)
(MC-SW-77/81) Avail: NTIS HC A02/MF A01

The asymptotic behavior of Bayes tests, developed by Johnson and Truax for exponential families, is generalized to families of distributions satisfying a sufficiently strong local asymptotic normality condition. The analysis considers only the case of a single parameter and a simple, zero-one, loss function. An approximate form for the Bayes acceptance region in terms of a local sufficient statistic is obtained, as well as the asymptotic form of the Bayes risk. The dependence of the risk on the prior distribution is considered. Author (ESA)

N83-13922# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
AN EDGEWORTH EXPANSION FOR SIMPLE LINEAR RANK STATISTICS UNDER THE NULL HYPOTHESIS
Ronald J. M. M. Does Dec. 1981 34 p refs Submitted for publication
(MC-SW-78/81) Avail: NTIS HC A03/MF A01

Assuming certain restrictions for the values of the regression constants and the scores generating functions, an Edgeworth expansion for simple linear rank statistics is established under the null hypothesis with a remainder function of 1/N for a wide class of score generating functions, including the normal quantile function. The theorem is proved and the results are compared with those in Bickel and VanZwet for the two-sample linear rank statistic. Author (ESA)

N83-13923# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
A NOTE ON AN INEQUALITY OF CHERNOFF
Chris A. J. Klaassen Dec. 1981 8 p refs Submitted for publication
(MC-SW-79/81) Avail: NTIS HC A02/MF A01

A generalization of Chernoff's inequality is presented. Although this derivation is not restricted to the normal case, it is simpler than the one given in Chernoff. A proof is given, based on the Cauchy-Swartz inequality. The values of the upper bound for choices of distributions and parameters are also presented. Author (ESA)

N83-13924# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
UNDERSTANDING COX'S REGRESSION MODEL: A MARTINGALE APPROACH
R. D. Gill Feb. 1982 24 p refs Submitted for publication
(MC-SW-81/82) Avail: NTIS HC A02/MF A01

Work which shows how a firm mathematical basis can be given to Cox's model is discussed. The original hazard rate

definition of the model of Cox can be directly interpreted as specifying the stochastic intensity of a multivariate counting process. These concepts can be related to martingale and stochastic integral theory. It is shown how these techniques can be used to derive Cox's estimator as an ordinary maximum likelihood estimator, and how asymptotic properties of the estimator also follow simply from this formulation of the model.Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-13925# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
APPLICATION OF THE ALPHA-BETA METHOD TO DISCRETIZED DIFFERENTIAL GAMES [APLICACAO DO METODO ALFA-BETA A JOGOS DIFERENCIAIS DISCRETIZADOS]
Julia Leocadia deOliveira May 1982 5 p refs In PORTUGUESE Presented at the INPE-LCC Seminar, Rio de Janeiro, 25-27 Nov. 1981
(INPE-2407-PRE/117) Avail: NTIS HC A02/MF A01

A model for the solution of discrete-time differential games involving two players is presented. The control variables in the games are also discrete and are selected alternatively by the players using the alpha-beta procedure, which is a refinement of the heuristic minimax technique. Three examples of different pursuit games are presented to illustrate the use of the method.
Transl. by J.D.

N83-13926# RAND Corp., Santa Monica, Calif.
PROSPECTS AND PROBLEMS FOR A GENERAL MODELING METHODOLOGY
M. Davis, S. Rosenschein, and N. Shapiro Jun. 1982 35 p
(RAND/N-1801-RC) Avail: NTIS HC A03/MF A01

A methodology by which modelers would be provided with a general purpose language for specifying models of arbitrary character as well as automated and semiautomated deductive capabilities for their formal manipulation is proposed. Even without computer aided deduction, such a language could be useful simply for the precise specification of models. Development of a language that can smoothly express quantitative and qualitative notions in the context of a stand alone model is advocated. A little girl bouncing a ball was modeled. This situation involves both physical constraints and human decision making, in a tightly intertwined manner. A model of this situation and an illustrative language for expressing that model was developed. This exercise turned out to be very useful in demonstrating the importance of a stand alone model and of the ability to smoothly combine qualitative and quantitative model elements. The program also depends on some improvement in automatic deduction. That issue is discussed. J.D.

N83-13927# Laboratory for Electronic Development of the Armed Forces, Oegstgeest (Netherlands).
PREDICTION METHODS FOR AIR DEFENSE GUNS
L. G. Boehmer 10 Jun. 1982 47 p refs In DUTCH; ENGLISH summary
(Contract A78/KLu/064)
(LEOK-TR-1982-04; TDCK-76639) Avail: NTIS HC A03/MF A01

Two filtering methods for use in air defence with guns were investigated. The first method is based on polynomial fitting of data points of a trajectory. The order of the polynomial is selected by a minimum variance criterion. This polynomial fitting method performs well. A second method is based on the continuous Kalman filter. The stationary solution was used to design a filter with fixed coefficients, taking into account physical constraints for target maneuvers. The second order solution of this filter is identical to the alpha-beta tracker, according to Benedict and Bordner for the continuous case. The third order solution of the Kalman filter deviates from the alpha-beta-gamma filter which results in an improved performance. The simplicity of both design method and filter allows more detailed studies, such as degradation due to incorrect parameters, adaption, optimal prediction, computerized indication of hit probability and so on. Author (ESA)

N83-13928# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
MACHINE SCHEDULING WITH PRECEDENCE CONSTRAINTS
E. L. Lawler (California Univ., Berkeley) and J. K. Lenstra Sep. 1981 21 p refs Presented at Symp. on Ordered Sets, Banff, Canada, 28 Aug.-12 Sep. 1981 Submitted for publication
(Grant NSF MCS-78-20054)
(MC-BW-148/81) Avail: NTIS HC A02/MF A01

Theory of precedence constrained scheduling problems is surveyed. Such problems ask for an optimal allocation of machines to jobs subject to a number of constraints, including a partial ordering of the jobs. Computational complexity theory is introduced and several problem classes for which polynomial-time algorithms exist are reviewed. These results are commented on with reference to problems that are known to be NP-hard. Author (ESA)

N83-13929# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
ANALYSIS OF HEURISTICS OF TWO-MACHINE FLOW-SHOP SEQUENCING SUBJECT TO RELEASE DATES
C. N. Potts (Keele Univ.) Nov. 1981 17 p refs Submitted for publication
(MC-BW-150/81) Avail: NTIS HC A02/MF A01

The two-machine flow-shop problem is considered in which each job becomes available for processing at its release date after which it must be processed without interruption on the first machine and then on the second machine. The maximum completion time is minimized. Three heuristics are presented which each have a worst-case performance ratio of 2. One of these is modified to give an improved worst-case performance ratio of 5/3.
Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N83-13930# New South Wales Univ., Kensington (Australia). Dept. of Physical Chemistry.
THE RACAH ALGEBRA FOR GROUPS WITH TIME REVERSAL SYMMETRY. PART 2: TABLES Ph.D. Thesis
Jan Dennis Newmarch 1981 378 p refs 2 Vol.
Avail: NTIS HC A17/MF A01

Many single crystals are fairly regular in structure and have the symmetry (to a good approximation) of a point group. This symmetry restricts the possible forms of the space part of the quantum mechanical energy functions to those which form irreducible basis vectors for an irreducible representation of the symmetry group. Such groups are the point groups K, O, T, D sub n and C sub n and if reflections and space inversions are also included, O sub h, D sub nd, C sub nv, etc. In cases where the spin orbit coupling is larger than the crystal field it is customary to use spinor wave functions, and the geometrical symmetry still applies as though the spinor representations of the double groups K(*), O(*), D, T(*), D(*) sub n and C(*) sub n are used. S.L.

N83-13931# Argonne National Lab., Ill.
NON-EVALUATION APPLICATIONS FOR COVARIANCE MATRICES
D. L. Smith May 1982 116 p refs
(Contract W-31-109-eng-38)
(DE82-019480; ANL/NDM-67) Avail: NTIS HC A06/MF A01

The possibility for application of covariance matrix techniques to a variety of common research problems other than formal data evaluation are demonstrated by means of several examples. These examples deal with such matters as fitting spectral data, deriving uncertainty estimates for results calculated from experimental data, obtaining the best values for plurally-measured quantities, and

methods for analysis of cross section errors based on properties of the experiment. The examples deal with realistic situations encountered in the laboratory, and they are treated in sufficient detail to enable a careful reader to extrapolate the methods to related problems. DOE

N83-13932# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ORBITS ON REAL AFFINE SYMMETRIC SPACES. PART 1: THE INFINITESIMAL CASE
G. vanDijk (Leiden Univ., Netherlands) Mar. 1982 24 p refs Submitted for publication
(MC-ZW-172/82) Avail: NTIS HC A02/MF A01

Infinitesimal orbit theory on real affine symmetric spaces is explained. Main references are the results by Kostant and Rallis on complex symmetric spaces and the treatment by Varadarajan of the theory of orbits under the adjoint group. Partial results are due to Oshima and Matsuki. The problem of the existence of invariant measures on the orbits in symmetric spaces is considered. Author (ESA)

N83-13933# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON SOME SEQUENCES DEFINED BY RECURRENCE RELATIONS OF INCREASING LENGTH
J. vandeLune May 1982 18 p refs
(MC-ZW-174/82) Avail: NTIS HC A02/MF A01

Convexity properties of the sequence (s sub n) n = zero to infinity, defined by s sub zero: = 1 and the recurrence relation s sub n = (s sub zero (n))/alpha + s sub 1 (n-1)/alpha + ... + sub (n-2) 2/alpha = s sub (n-1), n > zero, in which alpha is any positive constant, are discussed. Author (ESA)

N83-13934# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
A POLYNOMIAL-TIME ALGORITHM FOR SOLVING THE SET COVERING PROBLEM ON A TOTALLY-BALANCED MATRIX
Antoon W. J. Kolen Sep. 1981 15 p refs
(MC-BW-147/81) Avail: NTIS HC A02/MF A01

A (0,1) matrix that is totally balanced, i.e., it does not contain a square submatrix of size at least three which has no identical columns, and its row and column sums are equal to two, is considered. Let A be an nxm totally balanced matrix. An 0 ((min[m,n]) squared max [m,n]) algorithm is given to solve the set covering problem defined on A; a tree location problem serves as an example of such a set covering problem. An algorithm which recognizes an nxm totally balanced matrix (m< or = N) in 0 (nm squared) time is also shown. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N83-13935# Committee on Science and Technology (U. S. House).
NATIONAL ENGINEERING AND SCIENCE POLICY
Washington GPO 1982 84 p Hearing before the Subcomm. on Sci., Res., and Technol. of the Comm. on Sci. and Technol., No. 80, 97th Congr., 1st Sess., 14 Dec. 1981
(GPO-90-942) Avail: Subcommittee on Science, Research and Technology

A report on a hearing before the House of Representatives Subcommittee on Science, Research, and Technology is presented. Special attention is given to the training of engineers, mathematicians, and scientists, and the facilities now available for their education. L.F.M.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N83-13936*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
PREDICTION OF SOUND RADIATION FROM DIFFERENT PRACTICAL JET ENGINE INLETS Final Technical Report, 2 Jun. 1980 - 31 Jul. 1982
William L. Meyer and Ben T. Zinn 31 Jul. 1982 365 p refs
(Grant NAG3-67)
(NASA-CR-169533; NAS 1.26:169533) Avail: NTIS HC A16/MF A01 CSCL 20A

Computer codes which were based upon a special integral representation of the external solutions of the Helmholtz equation were upgraded so that they would yield accurate results for the acoustic radiation patterns in the field surrounding an axisymmetric body for nondimensional wave numbers, based on duct radius, of up to twenty. The accuracy of these computer programs was checked by the use of the point source method for the generation of exact solutions and then by comparison with the results of other experimental and theoretical studies. These computer codes were used in a parametric study of the dependence of the radiated sound field on input modal distribution, wave number, and inlet lip shape. The results of this study show that: (1) as the wave number (i.e., cut off ratio) is increased for a given input modal distribution that the acoustic radiation peak moves towards the inlet centerline and becomes more compact (i.e., narrows); (2) as the input mode number is increased for a given cut off ratio the acoustic radiation peak moves away from the inlet centerline and becomes more compact. S.L.

N83-13937*# Wyle Labs., Inc., Arlington, Va.
SHOULD HELICOPTER NOISE BE MEASURED DIFFERENTLY FROM OTHER AIRCRAFT NOISE? A REVIEW OF THE PSYCHOACOUSTIC LITERATURE Final Report
John A. Molino Washington NASA Nov. 1982 90 p refs
(Contract NAS1-16276)
(NASA-CR-3609; NAS 1.26:3609; WR-82-19) Avail: NTIS HC A05/MF A01 CSCL 20A

A review of 34 studies indicates that several factors or variables might be important in providing a psychoacoustic foundation for measurements of the noise from helicopters. These factors are phase relations, tail rotor noise, repetition rate, crest level, and generic differences between conventional aircraft and helicopters. Particular attention was given to the impulsive noise known as blade slap. Analysis of the evidence for and against each factor reveals that, for the present state of scientific knowledge, none of these factors should be regarded as the basis for a significant noise measurement correction due to impulsive blade slap. The current method of measuring effective perceived noise level for conventional aircraft appears to be adequate for measuring helicopter noise as well. Author

N83-13938# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
THE INFLUENCE OF FRESNEL NUMBER AND SECONDARY GEOMETRIC PARAMETERS ON THE DIFFRACTED FIELD OF PLANAR LAMINA
R. L. M. Wong and Hu Zhangwei (Nanjing Aeronautical Inst.) May 1982 26 p refs
(UTIAS-TN-237; ISSN-0082-5263) Avail: NTIS HC A03/MF A01

The approximate diffraction formalism of Keller and others is re-examined and cast into three explicit terms, each of which is given a physical interpretation. The new aproximate forms are valid for Fresnel numbers as small as .05. In this regime the often neglected secondary parameters make significant contributions. The scheme is applied to several test cases and performs very well. Author

N83-13939*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RECENT RESULTS ABOUT FAN NOISE: ITS GENERATION, RADIATION AND SUPPRESSION
Charles E. Feiler 1982 37 p refs Presented at the 19th Ann. Meeting of the Soc. of Eng. Sci., Rolla, Mo., 27-29 Oct. 1982
(NASA-TM-83002; E-1438; NAS 1.15:83002) Avail: NTIS HC A03/MF A01 CSCL 20A

Fan noise including its generation, radiation characteristics, and suppression by acoustic treatment is studied. In fan noise generation, results from engine and fan experiments, using inflow control measures to suppress noise sources related to inflow distortion and turbulence, are described. The suppression of sources related to inflow allows the experiments to focus on the fan or engine internal sources. Some of the experiments incorporated pressure sensors on the fan blades to sample the flow disturbances encountered by the blades. From these data some inferences can be drawn about the origins of the disturbances. Also, hot wire measurements of a fan rotor wake field are presented and related to the fan's noise signature. The radiation and the suppression of fan noise are dependent on the acoustic modes generated by the fan. Fan noise suppression and radiation is described by relating these phenomena to the mode cutoff ratio parameter. In addition to its utility in acoustic treatment design and performance prediction, cutoff ratio was useful in developing a simple description of the radiation pattern for broadband fan noise. Some of the findings using the cutoff ratio parameter are presented. S.L.

N83-13940# Deutsche Lufthansa Aktiengesellschaft, Cologne (West Germany).
AIRCRAFT NOISE PROBLEMS [DIE PROBLEMATIK DES FLUGLAERMS]
Jan. 1981 98 p In GERMAN
Avail: NTIS HC A05/MF A01

The problems related to aircraft noise were studied. Physical origin (sound), human reaction (noise), quantization of noise and sound sources of aircraft noise are discussed. Noise abatement at the source, technical, fleet-political and air traffic measures are explained. The measurements and future developments are also discussed. The position of Lufthansa as regards aircraft noise problems is depicted. Author (ESA)

N83-13941# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
HIGH FREQUENCY NOISE MEASUREMENTS DURING CNEN/NIRA STEAM GENERATOR TESTING AT LES RENARDIERES
A. Clapis, D. Scandolo, V. Regis, and R. Rappini 1981 33 p Presented at Topical Meet. on LMFBR Steam Generators, Genoa, 30 Nov.-2 Dec. 1981
(Contract ENEL-DARSA-39/400)
(CISE-1751) Avail: NTIS HC A03/MF A01

The most significant results of the acoustic measurements carried out on the PGV-1 sodium-steam generator during the test of the 50 MW prototype on the CGVS loop facility are described. The prototype test was done in the isothermal condition, i.e., without steam production and in the power condition. During the first phase tests were made with low pressure hydrogen injection in sodium. The main purpose of the acoustic measurements, limited to the 100 to 1000 kHz frequency range, was to evaluate the noise characteristics (level and power spectrum) in all working states of the plant. A small leak of gas found in the isothermal condition enabled the sensitivity of the acoustic leak detection technique to be evaluated qualitatively. The results in form of spectral analysis charts are included. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-13942# Council for Scientific and Industrial Research, Pretoria (South Africa). National Accelerator Centre.
[ESTABLISHMENT OF A NATIONAL ACCELERATOR FACILITY: DESIGN AND CONSTRUCTION PHASE] Annual Report
Jun. 1981 210 p
(NAC/AR/81-01) Avail: NTIS HC A10/MF A01

The main components of an accelerator facility for nuclear physics, isotope production, and radiotherapy in South Africa are in 8-MeV solid pole injector cyclotron and a separated sector cyclotron with a k-value of 200 MeV. Progress made in the development of the light ion injector and in the design of the control and beam transport systems is described. Mechanical and engineering tasks associated with component manufacture are discussed as well as the construction of the building to house the facility and the installation of necessary services. A.R.H.

N83-13943*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RYDBERG-KLEIN-REES 1-SIGMA-POSITIVE POTENTIAL CURVE TURNING POINTS FOR THE ISOTOPES OF CARBON MONOXIDE
C. Chackerian, Jr. and D. Goorvitch Jun. 1982 18 p refs
(NASA-TM-84266; A-8081; NAS 1.15:84266) Avail: NTIS HC A02/MF A01 CSCL 20H

First order RKR turning points were computed for (C-12)O16, (C-12)O17, (C-13)O16, (C-12)O18, and (C-13)O18 for vibrational levels up to $v = 40$. These turning points should be useful in the numerical computation of matrix elements of powers of the internuclear separation. Author

N83-13944# Bedford Research Associates, Mass.
LOW ENERGY ELECTRON AND PHOTON CROSS SECTIONS FOR O, N2 AND O2 AND RELATED DATA
H. T. Wadzinski and J. R. Jasperse 4 Jan. 1982 367 p refs
(Contract F19628-80-C-0126; AF Proj. 4643)
(AD-A118921; AFGL-TR-82-0008; AFGL-ERP-762) Avail: NTIS HC A016/MF A01 CSCL 04/1

The purpose of this report is to provide a set of low energy (0-300 eV) cross sections for use in calculating the photoelectron flux in the terrestrial daytime ionosphere. Also given are data on the neutral particle composition of the upper atmosphere and ionizing electromagnetic radiation from the Sun. GRA

N83-13945# California Inst. of Tech., Pasadena. Chemical Physics Lab.
DYNAMICS OF HYDROGEN ATOM AND PROTON TRANSFER REACTIONS. NEARLY DEGENERATE ASYMMETRIC CASE
V. Babamov, V. Lopez, and Rudolph A. Marcus 9 Sep. 1982 33 p refs
(Contract N00014-79-C-0009)
(AD-A119384; CONTRIB-6726; TR-12) Avail: NTIS HC A03/MF A01 CSCL 20/8

A method for approximate treatment of collinear H-atom or proton transfer reactions AH + B yields A + HB which involve two nearly degenerate vibrational states is developed. The method is based on constructing a diabatic representation of the problem, i.e., one in which the reactant and the product vibrational states are distinguished as such throughout the collision. The diabatic representation is constructed with the aid of the adiabatic one discussed in an earlier paper. The treatment can also be applied to symmetric exchange reactions in which case it gives results in good agreement with other results. Author (GRA)

N83-13946# Mission Research Corp., Albuquerque, N. Mex.
LINEAR STABILITY OF THE MODIFIED BETATRON Interim Report
T. P. Hughes and B. B. Godfrey Apr. 1982 32 p refs
(Contract N00014-81-C-0647)
(AD-A119376; AMRC-R-354) Avail: NTIS HC A03/MF A01 CSCL 20/7

The linear stability of the modified betatron is investigated by deriving and numerically solving a dispersion relation. For nonresis-

tive modes, growth rates significantly larger than those of previous calculations are obtained. The effects of a thermal spread in beam energy is estimated, and we conclude that there will be significant Landau damping of the most dangerous nonresistive and resistive modes. Author (GRA)

N83-13947# National Academy of Sciences - National Research Council, Washington, D. C. Subcommittee on Nuclear and Radiochemistry.
SEPARATED ISOTOPES: VITAL TOOLS FOR SCIENCE AND MEDICINE
National Academy Press 1982 283 p refs Workshop on Stable Isotopes and Derived Radioisotopes held at Washington, D.C., 2-4 Feb. 1982
(Contracts DE-FG02-81ER-10984; N01-OD-2-2117)
(DE82-018407; DOE/ER-10984/6) Avail: NTIS HC A13/MF A01

Uses for, supplies of, and methods of production for enriched stable isotopes were discussed. For individual titles, see N83-13948 through N83-13957.

N83-13948# National Academy of Sciences - National Research Council, Washington, D. C.
RESEARCH APPLICATIONS IN PHYSICS, CHEMISTRY, AND GEOSCIENCE
In its Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 3-14 (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

Research applications of separated stable isotopes in the fields of nuclear physics and chemistry, solid state physics and chemistry, geoscience, fission and fusion reactor technology, and for analytical uses are described. The consumption of these isotopes in physics, chemistry and geoscience is presented in a table for the years 1979 to 1981. The 20 isotopes for which the largest expenditures were made are also listed in a table. Excluding the light isotopes Li 6, 7, B10, the annual rate of consumption from 1979 to 1981 was nine gram atoms per year. If nondestructive uses are included, the usage rate was about 160 gram atoms per year. At current prices, the consumption rate corresponds to an expenditure of roughly $500,000 per year. Scientific progress is now seriously hampered by the unavailability of 60 of the 240 isotopes normally for sale. It is vital that the sales inventory of stable isotopes be restored to an adequate level as soon as practicable. For certain use of enriched isotopes, such as in ion sources, where high enrichment is not always required, isotopes may become available through separation techniques at substantially less expense than electromagnetic separation. DOE

N83-13949# National Academy of Sciences - National Research Council, Washington, D. C.
COMMERCIAL APPLICATIONS
In its Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 15-21 (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

The near term (one to five year) needs of domestic and foreign commercial suppliers of radiochemicals and radiopharmaceuticals for electromagnetically separated stable isotopes are assessed. Only isotopes purchased to make products for sale and profit are considered. Radiopharmaceuticals produced from enriched stable isotopes supplied by the Calutron facility at ORNL are used in about 600,000 medical procedures each year in the United States. A temporary or permanent disruption of the supply of stable isotopes to the domestic radiopharmaceutical industry could curtail, if not eliminate, the use of such diagnostic procedures as the thallium heart scan, the gallium cancer scan, the gallium abscess scan, and the low radiation dose thyroid scan. An alternative source of enriched stable isotopes exist in the USSR. Alternative starting materials could, in theory, eventually be developed for both the thallium and gallium scans. The development of a new technology for these purposes, however, would take at least five years and would be expensive. Hence, any disruption of the supply of enriched isotopes from ORNL and the resulting unavailability of critical nuclear medicine procedures would have a dramatic negative effect on the level of health care in the United States. DOE

N83-13950# National Academy of Sciences - National Research Council, Washington, D. C.
BIOMEDICAL RESEARCH APPLICATIONS
In its Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 23-27 (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

Adequate support and operation in a way that optimizes its services to the scientific and technological community is recommended. A continuing need for a reliable supply of a wide variety of enriched stable isotopes is seen. Future requirements for stable isotopes are impossible to document because of the unpredictability of research itself. The demand of biomedical research as a whole. There are a number of promising research projects at the present time, and these are expected to lead to an increase in production requirements. It is recommended that a high degree of priority be given to replacing the supplies of the 65 isotopes (out of the 224 previously available enriched isotopes) no longer available from ORNL. DOE

N83-13951# National Academy of Sciences - National Research Council, Washington, D. C.
CLINICAL APPLICATIONS
In its Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 29-32 (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

Contributions of the Oak Ridge Calutron facility to the development and subsequent production of a majority of currently useful medical radionuclides are discussed and recommendations for future achtions presented. The role of stable isotopes in the development of radiopharmaceuticals is described. Some examples are: stable isotope molybdenum 98 for producing radiopharmaceuticals incorporating technetium 99m; thallium 203 precursor for thallium 201 which is used as tracers in the detection of coronary heart disease; and the zinc 68 precursor of gallium 67 which is used in the diagnosis of tumors and infections. The continued availability of the isotopic materials necessary for optimal health care can only be achieved by taking the following actions: (1) stocks of all the stable isotopes from which products for research and patient care are derived must be expanded and maintained; (2) all facilities, including the calutrons, capable of furnishing products to meet these needs should be identified and described; (3) federal support for the research and development of alternative separation methods should continue; and (4) an advisory committee should be created to set realistic goals, to evaluate resources, and coordinate overall efforts. DOE

N83-13952# Oak Ridge National Lab., Tenn. Operations Div.
THE STABLE ISOTOPE ENRICHMENT PROGRAM AT OAK RIDGE NATIONAL LABORATORY
E. Newman *In* NAS-NRC Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 45-80 (For primary document see N83-13947 04-72)
(Contract W-7405-eng-26)
Avail: NTIS HC A13/MF A01

By means of the isotope separation program at Oak Ridge National Laboratory, electromagnetically enriched stable isotopes are made available to the worldwide scientific community. Methods of enriching isotopes and the limitations that apply to the quantity and final assay of the separation products are discussed. A brief description of each production step, from the selection and preparation of initial feedstock to the recovery and distribution of isotopically enriched material, is presented. The future of the facility, the continued supply of enriched isotopes, and the response of the program to new and changing requirements are emphasized. DOE

N83-13953# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
NATIONAL USES AND NEEDS FOR SEPARATED STABLE ISOTOPES IN PHYSICS, CHEMISTRY, AND GEOSCIENCE

RESEARCH
Michael S. Zisman *In* NAS-NRC Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 81-153 refs (For primary document see N83-13947 04-72)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A13/MF A01

Present uses of separated stable isotopes in the fields of physics, chemistry, and the geosciences were surveyed to identify current supply problems and to determine future needs. Demand for separated isotopes remains strong, with 220 different nuclides having been used in the past three years. The largest needs, in terms of both quantity and variety of isotopes, are found in nuclear physics research. Current problems include a lack of availability of many nuclides, unsatisfactory enrichment of rare species, and prohibitively high costs for certain important isotopes. Demand for separated isotopes is expected to remain roughly at present levels, although a shift toward more requests for highly enriched rare isotopes is predicted. Use of neutron rich nuclides below A = 100 for proucing exotic ion beams at various accelerators and use of transition metal nuclei for nuclear magnetic resonance spectroscopy are expected to expand. An increase in the need for calibration standards for techniques of radiological dating, such as Sm/Nd and Lu/Hf is predicted, but in relatively small quantities. Most members of the research community would be willing to pay considerably more than they do now to maintain adequate supplies of stable isotopes. DOE

N83-13954# Brookhaven National Lab., Upton, N. Y. Chemistry Dept.
BIOMEDICAL RESEARCH APPLICATIONS OF ELECTROMAGNETICALLY SEPARATED ENRICHED STABLE ISOTOPES
Richard M. Lambrecht *In* NAS-NRC Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 185-224 (For primary document see N83-13947 04-72)
(Contract DE-AC02-76CH-00016; Grant NS-16801-01)
Avail: NTIS HC A13/MF A01

The current and projected annual requirements through 1985 for stable isotopes enriched by electromagnetic separation methods were reviewed for applications in various types of biomedical research: (1) medical radiosiotope production, labeled compounds, and potential radio-pharmaceuticals; (2) nutrition, food science, and pharmacology: (3) metallobiochemistry and environmental toxicology; (4) nuclear magnetic resonance, electron paramagnetic resonance, and moessbauer spectroscopy in biochemical, biophysical, and biomedical research; and (5) miscellaneous advances in radioactive and nonradioactive tracer technology. Radioisotopes available from commercial sources or routinely used in clinical nuclear medicine were excluded. Current requirements for enriched stable isotopes in biomedical research are not being satisfied. Severe shortages exist for Mg 26, Ca 43, Zn 70, Se 76, Se 77, Se 78, Pd 102, Cd 111, Cd 113, and Os 190. Many interesting and potentially important investigations in biomedical research require small quantities of specific elements at high isotopic enrichements. Author

N83-13955# Mound Lab., Miamisburg, Ohio.
ISOTOPE SEPARATION BY GASEOUS AND LIQUID THERMAL DIFFUSION AND BY CHEMICAL EXCHANGE
W. R. Wilkes *In* NAS-NRC Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 269-270 (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

The separation of isotopes by gaseous thermal diffusion, liquid thermal diffusion, and by chemical exchange is described. Gaseous thermal diffusion is now used only to separate noble gas isotopes and deuterium. Liquid thermal diffusion is currently used in the separation of chlorine, bromine, and sulfur isotopes. Preliminary work done on separating calcium and sulfur by chemical exchange, and current investigation on separating a number of metal isotopes is discussed. Capital costs are substantial but overall efficiency is high. Chemical exchange is best suited to separation of annual quantities of 100g or more. DOE

N83-13956# Avco-Everett Research Lab., Mass. Isotope Research Div.
LASER ISOTOPE SEPARATION: AN ALTERNATIVE PRODUCTION METHOD
G. Sargent Janes *In* NAS-NRC Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 271-272 refs (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

At present, less than five elements account for 70 to 80% of the demand for stable isotopes. This unbalanced demand severely limits the availability of the Calutrons at Oak Ridge for the task to which they are best suited, namely, the production of a wide variety of isotopes for research purposes. The atomic vapor laser isotope separation (LIS) process is an ideal supplementary alternative, since it offers the potential for rapid low-cost production of significant greater quantities of the isotopes in primary demand, mostly metals with mass numbers above 100. Fortunately, much of the R and D work on a process for separating uranium is also applicable to the separation of the isotopes of such elements as thallium, cadmium, osmium, tellurium, indium, and lead. These elements have qualitative similarities that would allow the development of a cost effective laser process that could be used to produce isotopes to a number of elements without major hardware changes. A laser process being developed for the separation of thallium is described. It may now be possible to supply a significant fraction of the current national need for thallium by undertaking a two to three year effort that would involve spending about $1 million for R and D and perhaps $2 million for construction of a pilot plant. DOE

N83-13957# National Academy of Sciences - National Research Council, Washington, D. C.
THE VACUUM ARC CENTRIFUGE
M. Krishnan and J. L. Hirshfield *In its* Separated Isotopes: Vital Tools for Sci. and Med. 1982 p 273-279 refs (For primary document see N83-13947 04-72)
Avail: NTIS HC A13/MF A01

The separation of elements and isotopes by means of rotating magnetized plasma columns using a laser-triggered vacuum arc centrifuge is described. This vacuum arc centrifuge is sustained by the erosion and ionization of the cathode material, thus producing relatively pure, highly ionized, rotating plasma columns of the cathode material. Any solid metal, or mixture of metals, can be converted into plasma, and the constituent isotopes partially separated in the centrifuge, by fabricating the arc cathode out of the desired metals. The device also offers the possibility of operation with nonconducting solid elements or compounds by imbedding the desired substance in a conducting matrix. A wide variety of metals and combinations of metals were studied, ranging from C through Cu to Cd/Sn. Typical angular rotation frequencies of approx. 100,000 rad/sec were measured, with concomitant enrichments up to a factor of two for Cu 65. The device in its present form is not a viable source of partially enriched stable isotopes at a competitive cost. DOE

N83-13958# New York Univ., New York. Dept. of Physics.
ENERGY-RELATED ATOMIC AND MOLECULAR STRUCTURE AND SCATTERING STUDIES Progress Report, 1 Jul. 1981 - 31 Dec. 1982
Benjamin Bederson 30 Jun. 1982 35 p refs
(Contract DE-AC02-78ER-04971)
(DE82-019149; DOE/ER-04971/4) Avail: NTIS HC A03/MF A01

The experimental determination of fundamental properties of atoms and molecules, and of molecular clusters, and their use as benchmarks in comparison with computed properties based on theoretical models are discussed. In particular, measurements of polarizabilities of highly polar molecules and their polymers, and of a number of important atomic elements, particularly several with high-Z are continuing. In a parallel program performing electron-scattering experiments are being performed on these systems. For the scattering program an entirely new apparatus was designed and constructed. Preliminary scattering measurements were made, and a summary of these and of problems

encountered in this work is presented. Recently completed alkali-halide dimer polarizability measurements led to a combined theoretical-experimental determination of alkali halide monomer polarizabilities: the first available values for these important parameters. An absolute electron-atomic lithium cross section enabled earlier measurements of electron-Li2 cross sections to be calibrated. DOE

N83-13959# Wisconsin Univ., Madison.
RESEARCH AND DEVELOPMENT ON OPTICALLY PUMPED POLARIZED ION SOURCES Technical Progress Report, 1 Feb. 1982 - 31 Jan. 1983
L. W. Anderson Jul. 1982 50 p refs
(Contract DE-AC02-81ER-40001)
(DE82-019288; DOE/ER-40001/33) Avail: NTIS HC A03/MF A01

Progress on the development of optically pumped polarized Li(+) and Na(+) ion sources is reported. The development of polarized (3)He(+) and H(+) ion sources using optically pumped Na vapor targets is also described. DOE

N83-13960# Los Alamos Scientific Lab., N. Mex.
PARTICLE-IN-CELL CODES: A TOOL FOR MODELING DYNAMICS OF CHARGED PARTICLE BEAMS
C. M. Snell Jun. 1982 24 p refs
(Contract W-7405-eng-36)
(DE82-019183; LA-9354-MS) Avail: NTIS HC A02/MF A01

Many problems in particle-beam and plasma physics involve nonlinear interactions that cannot be fully characterized by analytic methods. The electromagnetic particle-in-cell (PIC) computer simulation codes are the principal tools for understanding the behavior of such systems. The basic features of the PIC codes are summarized and their capabilities are demonstrated through a series of typical applied physics calculations covering Pierce instability, free electron lasers, beam plasma instabilities, and high intensity beams and diodes. DOE

N83-13961# Wisconsin Univ., Madison. Dept. of Medical Physics.
FRACTIONAL NEUTRON KERMA FOR HYDROGEN, CARBON, NITROGEN, AND OXYGEN DEDUCED FROM MICRODOSIMETRIC MEASUREMENTS
P. M. DeLuca, Jr., M. C. Schell, D. W. Pearson, and F. H. Attix 1982 11 p refs
(Contract DE-AC02-76EV-01105)
(DE82-019971; DOE/EV-01105/294) Avail: NTIS HC A02/MF A01

Paired microdosimetric counters were employed to deduce the neutron fractional KERMA values in A150 plastic. Event size spectra from 14.8-MeV neutron bombardment of a graphite walled proportional counter were used to unfold the H, C, N and C KERMA values from fast neutron irradiation of an A150 plastic walled counter. Results are compared for a four element A150 plastic model to the calculations of Caswell, et al. DOE

N83-13962# Oak Ridge National Lab., Tenn.
DETERMINATION OF SPECIES YIELD OF ION SOURCES USED FOR INTENSE NEUTRAL BEAM INJECTION
C. C. Tsai, C. F. Barnett, H. H. Haselton, R. A. Langley, and W. L. Stirling Aug. 1982 25 p refs
(Contract W-7405-eng-26)
(DE82-019728; ORNL/TM-8360) Avail: NTIS HC A02/MF A01

For efficient plasma heating, ion sources of neutral beam injectors should be capable of producing ion beams with an atomic fraction of 90% or higher. Diagnostic techniques for quantitatively determining source species yield have been developed and evaluated. These include a magnetic momentum analysis of the unneutralized ions passing through the neutralizer, an energy analysis of the atomic beam by electrostatic separation of ions emanating from a stripping cell, and a quantity versus implantation depth analysis of hydrogen implanted in a crystal by the Secondard Ion Mass Spectrometer (SIMS) technique. The operational features and the advantages and disadvantages of each technique will be discussed. If the effects of beamlet optics, energy straggling in the accelerator, and neutralizer gas scattering are taken into account, the results of the measurements using the three techniques are shown to be mutually consistent within experimental error. DOE

N83-13963# Tsukuba Univ. (Japan). Tandem Accelerator Center.
ACTIVITIES OF THE TANDEM ACCELERATOR CENTER Annual Report, 1 Apr. 1979 - 31 Mar. 1980
Takashi Mikumo 1980 193 p refs
(DE81-700382; UTTAC-33; NSSRP-32; AR-5) Avail: NTIS (US Sales Only) HC A09/MF A01; DOE Depository Libraries

Specific experiments and instrumentation and facility developments are discussed. The 12 UD Pelletron worked well and was utilized over 2900 hours as the time of beam on targets. The performance of the polarized ion source was good, and it produced the beams of polarized protons and deuterons as well as of alpha particles. The sputter ion source (TUNIS) replaced the direct extraction duoplasmatron in most cases, and it produced the beams of isotopes of O, F, Si, Cl, Ni, Cu, etc., without gas injection. The construction of the second measuring room was completed, and four beam courses were equipped with a general purpose scattering chamber, the devices for perturbed angular correlation, inner and outer shell ionization, and biological studies. The beam pulsing system was installed on the accelerator. Further efforts were made to develop detection and data processing systems. DOE

N83-13964# Bhabha Atomic Research Centre, Bombay (India). Chemical Engineering Div.
ISOTOPE EFFECT IN MONOLAYER, LOCALISED, IMMOBILISED ADSORPTION WITH SPECIAL REFERENCE TO NEON ADSORPTION ON POROUS GLASS AT CRYOGENIC TEMPERATURES
S. Srisaila and M. B. Bajpai 1980 60 p refs
(DE81-700644; BARC-1077) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Using statistical mechanics, a general formula for the separation factor of two isotopes between gas and adsorbate phases in a monolayer, localized, immobile adsorption on a heterogeneous surface, is derived. Special forms of this are discussed for which the familiar Bigeleisen form is one. Purer, Kalplan and Smith, in their work on neon isotopes separation by gas chromatograph through porous glass column at cryogenic temperatures, have reported that the separation factor first increased and then decreased as the temperature was decreased, whereas monotonic increase was the normally expected behavior. Moiseyev has attempted to explain the anomaly after assuming two types of adsorption sites. The present theory gives the conditions in which monotonic and nonmonotonic variations can occur and after making some assumptions, the experimental curve of Purer, et al, could be reproduced computationally using one form of the general expression. DOE

N83-13965# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
ANALYSIS OF AQUEOUS AND ORGANIC FISSION-PRODUCT SOLUTIONS BY ENERGY-DISPERSIVE X-RAY FLUORESCENCE
R. D. Brooksbank and J. H. Stewart, Jr. 1981 7 p refs Presented at the 25th Conf. on Anal. Chem. and Nucl. Technol., Gatlinburg, Tenn., 6 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001449; CONF-811025-15) Avail: NTIS HC A02/MF A01

Existing data on extractions are reevaluated. Energy dispersive X-ray fluorescence (XRF) is a multielement technique, unaffected by chemical states, capable of analyzing both aqueous and organic solutions. This technique is applied to the determination of U, Pu, Th, Mo, Zr and Re in cold flow sheet developmment. GRA

N83-13966# Science Research Council, Chilton (England).
THEORETICAL APPROACHES TO CHARM HADROPRODUCTION

B. L. Combridge 1982 10 p refs
(PB82-226606; RL-82-027) Avail: NTIS HC A02/MF A01 CSCL 20H

Some theoretical models for the hadronic production of charmed states are reviewed, with emphasis on problems encountered and questions raised by the various descriptions. The main topics discussed are the G(q bar)yields c(c bar) and gg yields c(c bar) mechanisms, intrinsic charm, and charm 'excitation'. GRA

N83-13967# Science Research Council, Chilton (England).
RECENT RESULTS FROM TASSO (1)
B. Foster 1982 29 p refs
(PB82-226648; RL-82-025) Copyright. Avail: NTIS HC A03/MF A01 CSCL 20H

The inclusive production of various hadrons in positron electron annihilation is discussed. These results, together with those on inclusive charged hadron production, are used to obtain information on fragmentation mechanisms and the production of heavy quark flavors in positron electron annihilation. GRA

N83-13968# Science Research Council, Chilton (England).
LIFETIMES OF CHARMED PARTICLES PRODUCED IN A 20 GeV GAMMA(P) EXPERIMENTS: SLAC HYBRID FACILITY PHOTON COLLABORATION
1982 16 p refs Sponsored in part by Japan-US Cooperative Research Project on High Energy Physics, UK Science and Engineering Research Council, DOE, US-Israel B.S.F., NSF and Israel Academy of Sciences Commission for Basic Research
(PB82-226655; RL-82-005; SU-SLAC-PUB-2870; TUHEL-A2-01) Avail: NTIS HC A02/MF A01 CSCL 20H

Eleven neutral and nine charged decays of charmed particles have been observed in a sample of 205,000 hadronic interactions in a 1.2 million picture exposure of the SLAC hybrid facility to a 20 GeV/c backward scattered laser beam. The charged and neutral lifetimes were determined. GRA

N83-13969# Oxford Univ. (England). Nuclear Physics Lab.
RELATIVISTIC PARTICLE IDENTIFICATION BY DE/dx: THE FRUITS OF EXPERIENCE WITH ISIS
W. W. M. Allison 1982 13 p refs Presented at the Intern. Conf. on Instrumentation for Colliding Beam Phys.
(PB82-226887; NPL-16/82) Avail: NTIS HC A02/MF A01 CSCL 20H

The experience of ten years of studying dE/dx is summarized. First, a helpful, if qualitative, picture of the electromagnetic field of a relativistic particle passing through a medium is discussed. Second, the salient steps in a rigorous calculation of dE/dx are outlined. Results of calculations for a variety of gases and configurations are given and the weakness of the calculation is pointed out. In the third section, the practical experience gained from the ISIS project is discussed. The systematic effects that have been overcome are listed, and the status and successes achieved with ISIS-1 and ISIS-2 to data are described. GRA

N83-13970# Oxford Univ. (England). Nuclear Physics Lab.
DETERMINATION OF THE NUCLEAR INTERACTION RADIUS AND TRANSPARENCY FROM THE OPTICAL MODEL PHASE SHIFTS
R. Dymarz (Inst. of Nuclear Physics, Cracow) and T. Kohmura (Tsukuba Univ.) 1982 17 p refs
(PB82-226911; NPL-30/82) Avail: NTIS HC A02/MF A01 CSCL 20H

A nuclear interaction radius is defined, based on the optical model phase shifts. It is used to calculate the transparency of the target nuclei in proton induced reactions. The use of this interaction radius leads to a reasonable value of the transparency. It is shown that the transparency is not negligibly small at energies where the reaction cross section reaches its maximum. Author (GRA)

N83-13802# Joint Publications Research Service, Arlington, Va.
IDENTIFICATION OF HEAVY NUCLEI IN RADIOBIOLOGICAL EXPERIMENTS IN SPACE
A. A. Marennyy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16 (JPRS-82194) 9 Nov. 1982 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosmicheskaya Med. (Moscow), v. 16, no. 5, Sep. - Oct. 1982 p 84-87 (For primary document see N83-13783 04-51)
Copyright. Avail: NTIS HC A08

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-13971*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPROVEMENTS TO THE LANGLEY HZE ABRASION MODEL
Lawrence W. Townsend (Old Dominion Univ.) and Hari B. Bidasaria Sep. 1982 21 p refs
(NASA-TM-84542; NAS 1.15:84542) Avail: NTIS HC A02/MF A01 CSCL 20H

Improvements to a previously developed high charge energy abrasion model are made by incorporating more realistic values for the constituent Fermi momentum and nucleon root-mean-square charge radius. The theoretical predictions for neon projectiles at 2.1 GeV/nucleon colliding with carbon and molybdenum targets are in excellent agreement with recent experiment results. Author

N83-13972# State Planning Council on Radioactive Waste Management, Washington, D.C.
RECOMMENDATION ON NATIONAL RADIOACTIVE WASTE MANAGEMENT POLICIES Report to the President
1981 67 p
(DE81-029916; DOE/TIC-1029916) Avail: NTIS HC A04/MF A01

Sound technical solutions to the problems of waste disposal cannot be carried out without public acceptance. The key to gaining the public's confidence is a process of decision making which is open and accessible to elected officials from all levels of government. Such a process can be put in place through a renewal of the traditional principles of the federal system of government State, local, and tribal officials must become working partners with the federal government in making the crucial decisions about how radioactive wastes will be handled, transported, and ultimately disposed. A workable and effective partnership must include, first the full sharing of information and plans regarding waste disposal activities among all levels of government and, second, the opportunity for state, local, and tribal governments to participate effectively in waste management decisions which affect their jurisdictions. DOE

N83-13973# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
PARAMETRIC STUDY OF GEOHYDROLOGIC PERFORMANCE CHARACTERISTICS FOR NUCLEAR-WASTE REPOSITORIES
Charles E. Bailey and I. Wendell Marine 1981 19 p ref Presented at the Geol. Soc. of Am. Meeting, Cincinnati, 2-5 Nov. 1981
(Contract DE-AC09-76SR-00001)
(DE82-003145; DP-MS-81-36; CONF-811142-1) Avail: NTIS HC A02/MF A01

Geohydrologic information in graphical form covering a wide range of parameters to aid in determining site specifications based on functional criteria are presented. Graphs of the major performance characteristics that influence the transport of radionuclides from a repository to the biosphere by groundwater are developed. The major characteristics addressed are radioactive decay, leach rate, hydraulic conductivity, porosity, groundwater gradient, hydrodynamic dispersion, ion exchange, and distance to the biosphere. GRA

N83-13974# Department of Energy, Washington, D. C.
SPECIAL-PURPOSE MATERIALS FOR MAGNETICALLY CON-

FINED FUSION REACTORS Annual Progress Report
J. L. Scott, comp. Nov. 1981 114 p
(DE82-005310; DOE/ER-0113; APR-3) Avail: NTIS HC A06/MF A01

Fusion reactor materials problems other than the first-wall and blanket structural materials are discussed. Components that are considered as special purpose materials include breeding materials, coolants, neutron multipliers, barriers for tritium control, materials for compression and OH coils and waveguides, graphite and SiC, heat-sink materials, ceramics, and materials for high-field superconducting magnets. DOE

N83-13975# Commissariat a l'Energie Atomique, Paris (France).
NUCLEAR FUEL CYCLE AND WASTE MANAGEMENT IN FRANCE
Yves Sousselier May 1981 9 p Presented at the Intern. Conf. on Computing in Civil Eng., New York, 11-15 May 1981
(DE81-700732; CEA-CONF-5721; CONF-810517-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

After a short description of the nuclear fuel cycle mining, milling, enrichment and reprocessing, radioactive waste management in France is exposed. The different types of radioactive wastes are examined. Storage, solidification and safe disposal of these wastes are described. DOE

N83-13976# California Univ., Livermore. Lawrence Livermore Lab.
SYNROC PROCESSING OPTIONS
R. B. Rozsa and C. L. Hoenig 1 Sep. 1981 16 p refs
(Contract W-7405-eng-48)
(DE82-004230; UCRL-53187) Avail: NTIS HC A02/MF A01

Synroc is a titanate-based ceramic material currently being developed for immobilizing high-level nuclear reactor wastes in solid form. Synroc D is a unique variation of Synroc. It can contain the high-level defense wastes, particularly those in storage at the Savannah River Plant. The early development of the initial Synroc process is reviewed, modification and other options that simplify it overall are discussed, and the future direction of research and development in the processing area is recommended. A reference Synroc process is described and contrasted with the Savannah River Laboratory glass-based reference case. Preliminary engineering layouts show Synroc to be a more complex processing operation and, thus, more expensive than the glass-based process. Possible simplifications, can significantly reduce the cost difference. Research and development continues in the areas of slurry processing, fluidized bed calcination, and mineralization using sintering, hot uniaxial pressing, or hot isostatic pressing. DOE

N83-13977# Centro Informazioni Studi Esperienze, Milan (Italy).
THE EXPERIENCE COLLECTED IN THE MANAGEMENT OF THE CENTRO INFORMAZIONI STUDI ESPERIENZE (CISE) RADIOACTIVE WASTE FROM 1960 TO 1980 [ESPERIENZE ACQUISITE NELLA GESTIONE DEI RIFIUTI RADIOATTIVI AL CISE DAL 1960 AL 1980]
C. Triulzi and N. Carifi 1981 18 p refs In ITALIAN Presented at 22nd A.I.R.P. Congr., Gardone, Italy, 23-26 Jun. 1981
(CISE-1738) Avail: NTIS HC A02/MF A01

The radioactive waste produced in a research center, its processing and destination are described. The radioactive waste is mainly solid (26 cu m) or inorganic liquid (65 cu m), although some paste (3 cu m) and organic liquids (0.1 cu m) were also produced. The disposal in each material category is described, including a block diagram of the liquid radioactive waste treatment plant. A time table shows that at the end of the period the stock of radioactive waste was reduced to 10 cu m. Author (ESA)

74 OPTICS

Includes light phenomena.

N83-13978* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

RHOMBOID PRISM PAIR FOR ROTATING THE PLANE OF PARALLEL LIGHT BEAMS Patent
Kenneth L. Orloff, inventors (to NASA) (ARO, Inc., Tullahoma, Tenn.) and Haruo Yanagita (ARO, Inc., Tullahoma, Tenn.) Issued 26 Oct. 1982 5 p Filed 24 Dec. 1980 Supersedes N81-16882 (19 - 07, p 0975) Sponsored by NASA
(NASA-Case-ARC-11311-1; US-Patent-4,355,870; US-Patent-Appl-SN-219640; US-Patent-Class-350-486; US-Patent-Class-350-287) Avail: US Patent and Trademark Office CSCL 20F

An optical system is described for rotating the plane defined by a pair of parallel light beams. In one embodiment a single pair of rhomboid prisms have their respective input faces disposed to receive the respective input beams. Each prism is rotated about an axis of revolution coaxial with each of the respective input beams by means of a suitable motor and gear arrangement to cause the plane of the parallel output beams to be rotated relative to the plane of the input beams. In a second embodiment, two pairs of rhomboid prisms are provided. In a first angular orientation of the output beams, the prisms merely decrease the lateral displacement of the output beams in order to keep in the same plane as the input beams. In a second angular orientation of the prisms, the input faces of the second pair of prisms are brought into coincidence with the input beams for rotating the plane of the output beams by a substantial angle such as 90 deg.
Official Gazette of the U.S. Patent and Trademark Office

N83-13979*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LARGE-APERTURE INTERFEROMETER USING LOCAL REFERENCE BEAM
Walton L. Howes Nov. 1982 20 p refs
(NASA-TP-2060; E-1153; NAS 1.60:2060) Avail: NTIS HC A02/MF A01 CSCL 20F

A large-aperture interferometer was devised by adding a local-reference-beam-generating optical system to a schlieren system. Two versions of the interferometer are demonstrated, one employing 12.7 cm (5 in.) diameter schlieren optics, the other employing 30.48 cm (12 in.) diameter parabolic mirrors in an off-axis system. In the latter configuration a cylindrical lens is introduced near the light source to correct for astigmatism. A zone plate is a satisfactory decollimating element in the reference-beam arm of the interferometer. Attempts to increase the flux and uniformity of irradiance in the reference beam by using a diffuser are discussed. R.J.F.

N83-13980*# Digital Communications Corp., Germantown, Md.
DEVELOPMENT, IMPLEMENTATION, AND TEST RESULTS ON INTEGRATED OPTICS SWITCHING MATRIX Final Report, 24 Aug. 1979 - 3 Oct. 1980
E. Rutz Oct. 1982 120 p
(Contract NAS5-25827)
(NASA-CR-170459; NAS 1.26:170459; DCC-1837-881-UM-1258) Avail: NTIS HC A06/MF A01 CSCL 20F

A small integrated optics switching matrix, which was developed, implemented, and tested, indicates high performance. The matrix serves as a model for the design of larger switching matrices. The larger integrated optics switching matrix should form the integral part of a switching center with high data rate throughput of up to 300 megabits per second. The switching matrix technique can accomplish the design goals of low crosstalk and low distortion. About 50 illustrations help explain and depict the many phases of the integrated optics switching matrix. Many equations used to explain and calculate the experimental data are also included.
Author

N83-13981*# Battelle Columbus Labs., Ohio.
DESIGN, FABRICATION AND EVALUATION OF CHALCOGENIDE GLASS LUNEBURG LENSES FOR LiNbO3 INTEGRATED OPTICAL DEVICES Final Report, Jun. 1981 - Sep. 1982
V. E. Wood, J. R. Busch, and C. M. Verber Hampton, Va. NASA. Langley Research Center Sep. 1982 55 p refs
(Contract NAS1-16652)

(NASA-CR-165972; NAS 1.26:165972) Avail: NTIS HC A04/MF A01 CSCL 20F

Optical waveguide Luneburg lenses of arsenic trisulfide glass are described. The lenses are formed by thermal evaporation of As2S3 through suitably placed masks onto the surface of LiNbO3:Ti indiffused waveguides. The lenses are designed for input apertures up to 1 cm and for speeds of f/5 or better. They are designed to focus the TM sub 0 guided mode of a beam of wavelength, external to the guide, of 633 nm. The refractive index of the As2S3 films and the changes induced in the refractive index by exposure to short wavelength light were measured. Some correlation between film thickness and optical properties was noted. The short wavelength photosensitivity was used to shorten the lens focal length from the as deposited value. Lenses of rectangular shape, as viewed from above the guide, as well as conventional circular Luneburg lenses, were made. Measurements made on the lenses include thickness profile, general optical quality, focal length, quality of focal spot, and effect of ultraviolet irradiation on optical properties. Author

N83-13982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OPTICAL DISTANCE MEASURING INSTRUMENT Patent Application

James B. Abshire, inventor (to NASA) Filed 10 Aug. 1982 18 p (NASA-Case-12761-1; US-Patent-Appl-SN-406820) Avail: NTIS HC A02/MF A01 CSCL 20F

An optical instrument, such as a stability monitor or a target range finder, uses an unstabilized laser to project a composite optical signal of coherent light having two naturally occurring longitudinal mode components. A beamsplitter divides the signal into a reference beam which is directed toward one photodetector and a transmitted beam which illuminates and is reflected from a distant target onto a second photodetector optically isolated from the first photodetector. Both photodetectors are operated on the square law principle to provide electrical signals modulated at a frequency equal to the separation between the frequencies of the two longitudinal mode components of the optical signal projected by the laser. Slight movement of the target may be detected and measured by electrically monitoring the phase difference between the two signals provided by the photodetectors and the range of the target measured with the aid of microprocessor by changing the separation between the longitudinal modes by shifting the length of the resonator cavity in an iterative series of increments. NASA

N83-13983# California Inst. of Tech., Pasadena.

OPTICAL PROPERTIES OF SMALL BAND GAP SEMICONDUCTORS SUBJECT TO LASER EXCITATION. NONLINEAR INFRARED PROPERTIES OF SEMICONDUCTORS Final Technical Report, 1 Jan. 1977 - 28 Feb. 1982

T. C. McGill and D. L. Smith (Honeywell Systems and Research Center, Minneapolis, Minn.) 1982 199 p refs

(Grant AF-AFOSR-3216-77; AF Proj. 2306)

(AD-A119264; AFOSR-82-0678TR) Avail: NTIS HC A09/MF A01 CSCL 20/5

A theoretical and experimental study of the optical properties of small band gap semiconductors subject to laser excitation and the nonlinear infrared properties of small band gap semiconductors subject to laser excitation and the nonlinear infrared properties of semiconductors has been carried out. These studies have led to an understanding of the nonradiative recombination mechanisms due to impurities via an Auger process. Predictions about the role of radiative and nonradiative processes in narrow band gap semiconductors have been made. Experiments performed on HgCdTe alloys with different composition provided the first systematic study of photoluminescence in these alloys and gave data that supported the conclusions on the relative importance of radiative and nonradiative processes in alloys. The study of the nonlinear infrared properties in the semiconductors resulted in the first complete theory of the phenomenon. Experiments to measure the role of impurities on the saturation intensity have given results in good agreement with theory. Author (GRA)

N83-13984# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

A BIDIRECTIONAL FIBER OPTIC LINK FOR GUIDED MISSILES

Karl H. Niederhofer and Robert M. Rieger 1981 14 p refs Presented at IDEE '82 Conf., Hanover, 18-20 May 1982

(MBB-UA-609/81) Avail: NTIS HC A02/MF A01

A bidirectional fiber optic link using an LED transceiver in the missile and a LED/PIN diode assembly at the launching platform was investigated. Essential system requirements and possible solutions are exposed. Results from an experimental setup for a wideband TV channel and a narrow band command signal are shown. Results from other possible bidirectional arrangements are included. The LED transceiver scheme is nearly equivalent to LED/PIN configurations. Improvements can be achieved in either case by using laser diodes and avalanche photo diodes. A link margin greater than 30 dB is feasible. An operational range up to 5km can be foreseen if the loss of the spooled fiber does not exceed 6 dB/km. Author (ESA)

N83-13985# Barbier, Benard et Turenne, Paris (France). Societe Parisienne des Anciens Etablissements.

STUDY OF A LARGE SIZE SOLAR SIMULATOR FOR ESTEC USE [ETUDE D'UN SIMULATEUR SOLAIRE DE GRANDES DIMENSIONS DESTINE A L'ESTEC]

P. Dejonc Paris ESA 1 Mar. 1982 122 p In FRENCH

(Contract ESTEC-4781/81/NL-PP(SC))

(BBT-350208; ESA-CR(P)-1638) Avail: NTIS HC A06/MF A01

The detailed optical study of a solar simulation system for the Noordwijk vacuum chamber is presented. A collimated beam system in which the beam is reflected by a vertical mirror placed in a horizontal external chamber was chosen. The optimization of a patented integrator-condenser, using lamps of up to 30 kW is described. This high yield condenser allows for a uniform light concentration at the outside of the vacuum chamber, and a particularly flexible spectral filtering. The projection device is composed of two big lenses, with one an integral part of the vacuum chamber wall. The condenser and lens supports, the air and water cooling, and the beam intensity regulation were studied to assure the stability and reliability of this solar simulation system. Author (ESA)

N83-13986# Rolls-Royce Ltd., Derby (England).

MEASUREMENT OF CURVATURE BASED ON THE MOIRE PRINCIPLE USING INTENSITY DISTRIBUTION

Reinhold Ritter 22 Jan. 1982 10 p refs Transl. into ENGLISH from Optik (West Ger.), v. 58, no. 5, 1981 p 341-350

(PNR-90129; Trans-16040; TLT-00861) Avail: NTIS HC A02/MF A01

An experimental method for measurement of curvature, based on the Ligtenberg reflection-Moire principle is described. If two identical grating images on which the grating lines are deformed by the studied object are superimposed, and if both are displaced relative to each other, the Moire effect appears. From the measured intensity distribution, the curvature of the object can be determined. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-13987# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

EXPLOSIVE-DRIVEN HEMISPHERICAL IMPLOSIONS FOR GENERATING FUSION PLASMAS

D. Sagie and I. I. Glass Mar. 1982 99 p refs

(UTIAS-TN-233; ISSN-0082-5263) Avail: NTIS HC A05/MF A01

An explosive-driven-implosion facility was used to produce stable, centered and focussed hemispherical implosions to

generate neutrons from D-D reactions. A high resolution scintillator-detection system measured the neutrons and gamma rays resulting from the fusion of deuterium. Several approaches were used to initiate fusion in deuterium. The simplest and most direct proved to be in a predetonated stoichiometric mixture of deuterium-oxygen. The other successful method was a miniature Voitenko-type compressor where a plane diaphragm was driven by the implosion wave into a secondary small spherical cavity that contained pure deuterium gas at one atmosphere. A great deal of work still remains in order to measure accurately the neutron flux and its velocity distribution as well as the precise interactions of the neutrons with the steel chamber which produced the gamma rays. M.G.

N83-13988# Nagoya Univ. (Japan). Inst. of Plasma Physics.
BUILD-UP SYMMETRIC SPACE POTENTIAL IN BUMPY TORUS
K. Takasugi, H. Iguchi, M. Fujiwara, and H. Ikegami Oct. 1982 16 p refs
(IPPJ-613) Avail: NTIS HC A02/MF A01

Radial profiles of the plasma space potential were measured in Nagoya bumpy torus (NBT-1) by the use of a rubidium ion beam probe. Asymmetric potential profiles owing to toroidal drift were observed in high pressure operation (C-mode). As the pressure is decreased, toroidal plasma is effectively heated (T-model), poloidal precessional frequency overcomes the electron collision frequency, and the potential profile becomes symmetric inside the hot electron ring. M.G.

N83-13989# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ANALYSIS OF TARGET IMPLOSION IRRADIATED BY PROTON BEAM. 1: BEAM INTERACTION WITH TARGET PLASMA
Moritake Tamba (Inst. of Physical and Chemical Research, Saitama, Japan), Norimasa Nagata (Tokyo Inst. of Technology, Yokohama, Japan), Shigeo Kawata (Tokyo Inst. of Technology, Yokohama, Japan), and Keishiro Niu (Tokyo Inst. of Technology, Yokohama, Japan) Oct. 1982 54 p refs
(IPPJ-612) Avail: NTIS HC A04/MF A01

Numerical simulations and analyses are given for the implosion of a hollow shell target driven by proton beams. The target consists of layers of Pb, Al, and DT. The Pb and Al layers play roles of a tamper and a pusher, respectively. The main part of the beam energy is deposited in the Al layer. But the process of deposition depends much on the distribution of incident angles and particle energies. As the Al layer is heated by proton beams, the layer expands and pushes the DT layer toward the target center. This kind of implosion motion is examined by using a similar solution for the slab model. The effect of inhomogeneities on implosion is shown to be severe. The fluctuation of temperature in the Al layer must be less than 10% and the deviation of the pusher thickness from the average should be less than microns to keep a high target gain. Author

N83-13990# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NON-CIRCULAR BUMPY TORUS
A. Tsushima, H. Tsuchidate, T. Kamimura, M. Fujiwara, and H. Ikegami Jul. 1982 35 p refs
(IPPJ-607) Avail: NTIS HC A03/MF A01

A bumpy torus with noncircular coils is studied analytically and numerically with respect to the confinement of high energy passing particles. The minimum position r sub Jmin of the longitudinal invariant J, and the confinement area sP for passing particles ($V^*/V = 1$) are calculated for the evaluation of confinement performance. As one example of noncircular bumpy tori, the inverse dee bumpy torus is found to be much superior to a circular one with the same aspect ratio when its value is large enough (A approx. > 20). M.G.

N83-13991# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ERROR FIELD MEASUREMENTS IN NBT-1M
H. Iguchi, A. Tsushima, K. Takasugi, A. Komori (Tohoku Univ., Sendai, Japan), M. Fujiwara, and H. Ikegami Jul. 1982 27 p refs
(IPPJ-606) Avail: NTIS HC A03/MF A01

The error field of Nagoya bumpy torus-1M was measured by the use of electron beam probing. It is found that the error field is mainly produced by dipoles at coil feeders and bus bars and the toroidally averaged field error $< B/B$ sub t > 0.0005 in average over the minor cross section of the torus. It can be reduced to less than 0.0001 with a dipole field coil. An adjustable toroidal coil was successfully tested to cancel error field coming from coil misalignment, demonstrating the possibility that machines can be constructed without field correction coils in the future. M.G.

N83-13992# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PLASMA ELECTRON DENSITY MEASUREMENTS BY LASER- AND COLLISION-INDUCED FLUORESCENCE METHOD
K. Tsuchida, S. Miyake (Osaka Univ., Japan), K. Kadota, and J. Fujita Jul. 1982 29 p refs
(IPPJ-605) Avail: NTIS HC A03/MF A01

A laser induced fluorescence method was developed to measure the spatial electron density distribution. The local electron density can be determined by observing the intensity ratio of the laser to the collision induced fluorescence. A spatial electron density distribution of a helium plasma was determined by observing the He(3(1)p to 2(1)S) laser induced fluorescence and the He(3(1)D to 2(1)P) collision induced fluorescence due to the He(3(1)P to 3(1)D) collisional transfer process with electrons. The comparison of the results with that of a conventional method proves this method is of practical use in the space resolved measurements of plasma electron density. M.G.

N83-13993# Sandia Labs., Albuquerque, N. Mex.
BEAM AND DEPOSITION STABILITY IN LIGHT-ION FUSION TARGETS
J. A. Swegle Mar. 1982 64 p refs
(Contract DE-AC04-76DP-00789)
(DE82-017768; SAND-82-0072) Avail: NTIS HC A04/MF A01

The plasma stability of beam target and deposition processes in parameter regimes appropriate to light ion driven inertial confinement fusion targets were reviewed. Electrostatic and electromagnetic streaming instabilities driven by a charge and current neutralized ion beam are emphasized. It is assumed that the beam is collisionless and that the target medium is homogeneous and infinite in extent. The two thermal instabilities which are discussed are: a potentially unstable interaction involving ion beam range shortening as the target temperature increases, and fluid condensation instability. It is found that the range shortening interaction are a stable process. DOE

N83-13994# Oak Ridge National Lab., Tenn.
FUSION RESEARCH AT ORNL
Mar. 1982 89 p refs
(Contract W-7405-eng-26)
(DE82-017766; ORNL/TM-8316) Avail: NTIS HC A05/MF A01

The ORNL fusion program which includes the experimental and theoretical study of two different classes of magnetic confinement schemes is outlined. The study includes: systems with helical magnetic fields, such as the Tokamak and stellarator, and the ELMO Bumpy Torus (EBT) class of toroidally linked mirror systems; the development of technologies, including superconducting magnets, neutral atomic beam and radio frequency (RF) heating systems, fueling systems, materials, and diagnostics; the development of the environment impact of magnetic fusion; and the design of advanced demonstration fusion devices. DOE

N83-13995# Oak Ridge National Lab., Tenn.
TOROIDAL GEOMETRY SUBROUTINES FOR MORSE-CG
M. Yamauchi, M. B. Emmett, R. T. Santoro, H. Iida, Y. Seki, and H. Narita Apr. 1982 48 p refs
(Contract W-7405-eng-26)
(DE82-014578; ORNL/TM-8244) Avail: NTIS HC A03/MF A01

The equations, coding, and procedures which are required to include a torus in the Combinatorial Geometry subroutines of the MORSE-CG code are described. The derivation and solutions of the quartic equation that describes a torus along with additional subroutines and the modifications to existing subroutines required to carry out the transport of neutrons and gamma rays in toroidal

geometry are presented. The input requirements and a sample problem are included. DOE

N83-13996# Los Alamos Scientific Lab., N. Mex.
EQUILIBRIUM POLOIDAL FIELD DISTRIBUTIONS IN REVERSED-FIELD-PINCH TOROIDAL DISCHARGES
D. A. Baker, L. W. Mann, and K. F. Schoenberg Apr. 1982 38 p refs
(Contract W-7405-eng-36)
(DE82-014130; LA-9L62-MS) Avail: NTIS HC A03/MF A01

A comparison between the analytic formulae of Shafranov for equilibrium in axisymmetric toroidal reversed field pinch (RFP) systems and fully toroidal numerical solutions of the Grad-Shafranov equation is presented as a function of poloidal beta, internal plasma inductance, and aspect ratio. The Shafranov formula for the equilibrium poloidal field distribution is accurate to within 5% for aspect ratios greater than 2, poloidal betas less than 50%, and for plasma current channels that exceed one-third of the minor toroidal radius. The analytic description for the center shift of the innermost flux surface that encloses the plasma current (the Shafranov shift) is accurate to within 15% for aspect ratios greater than 2 and poloidal betas below 50%, provided the shift does not exceed one-tenth of the minor conducting boundary radius. The behavior of the magnetic axis shift as a function of plasma parameters is included. The Shafranov formulae provide a convenient method for describing the equilibrium behavior of an RFP discharge. Examples illustrating the application of the analytic formulae to the Los Alamos ZT-40M RFP experiment are given. DOE

N83-13997# California Univ., Livermore. Lawrence Livermore Lab.
FEASIBILITY STUDY OF A FISSION-SUPPRESSED TANDEM-MIRROR HYBRID REACTOR
J. D. Lee, R. W. Moir, and W. L. Barr Apr. 1982 813 p refs
(Contract W-7405-eng-48)
(DE82-019375; UCID-19327) Avail: NTIS HC A99/MF A01

Results of a conceptual design study of a U-233 producing fusion breeder consisting of a tandem mirror fusion device and two types of fission suppressed blankets are presented. The majority of the effort was devoted to the conceptual design and evaluation of the two blankets. However, studies in the areas of fusion engineering, reactor safety, fuel reprocessing, other fuel cycle issues, economics, and deployment were also performed. DOE

N83-13998# Wisconsin Univ., Madison.
POLOIDAL OHMIC HEATING IN A MULTIPOLE
D. J. Holly, S. C. Prager, and J. C. Sprott Jul. 1982 22 p refs
(Contract DE-AC02-76ET-53051)
(DE82-019888; DOE/ET-53051/42) Avail: NTIS HC A02/MF A01

The feasibility of using poloidal currents to heat plasmas confined by a multipole field was examined experimentally in Tokapole 2, operating the machine as a toroidal octupole. The plasma resistivity ranges from Spitzer to about 1500 times Spitzer resistivity, as predicted by mirror-enhanced resistivity theory. This allows large powers (approx. 2 MW) to be coupled to the plasma at modest current levels. However, the confinement time is reduced by the heating, apparently due to a combination of the input power location (near the walls of the vacuum tank) and fluctuation-enhanced transport. Current-driven drift instabilities and resistive MHD instabilities appear to be the most likely causes for the fluctuations. DOE

N83-13999# Oak Ridge National Lab., Tenn.
ORNL INTEGRAL EXPERIMENT TO PROVIDE DATA FOR EVALUATING MAGNETIC-FUSION-ENERGY SHIELDING CONCEPTS. PART 1: ATTENUATION MESUREMENTS
G. T. Chapman, G. L. Morgan, and J. W. McConnell Aug. 1982 156 p refs
(Contract W-7405-eng-26)
(DE82-019775; ORNL/TM-7356-Pt-1) Avail: NTIS HC A08/MF A01

Integral experiments to measure the energy spectra of neutrons and gamma rays due to the transport of approximately 14 MeV T(d,n) (4)He neutrons through laminated stainless steel and borated polyethylene shield configurations were performed at the Oak Ridge National Laboratory. An NE 213 detector and conventional pulse shape discrimination circuitry were used to record the pulse height distributions from which the energy spectra were derived. Descriptions of the facility and experimental techniques are given along with tables and curves showing the results of the measurements. DOE

N83-14000# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
RADIAL GUIDING-CENTER DRIFTS AND OMNIGENITY IN BUMPY-TORUS CONFINEMENT SYSTEMS
R. D. Hazeltine and P. J. Catto Jul. 1982 27 p refs
(DE82-019802; SAI-254-82-200-LJ; PRI-45) Avail: NTIS HC A03/MF A01

Collisional transport of a high temperature plasma across the confining field of a bumpy torus magnetic confinement system which depends sensitively upon the functional form of the radial quiding center drift, and thus upon details of the confinement geometry is discussed. A general and relatively explicit formula for the radial drift is derived, using the large aspect-ratio results of a previous equilibrium study. Allowance is made for: (1) arbitrary toroidal variation of the confining field; (2) field distortion due to plasma currents; (3) noncircular deformation of the toroidal field coils. The analysis pertains only to the plasma core, and not to the high beta annuli (electron rings) which are usually present in experiments. The question of bumpy torus omnigenity whether any bumpy torus field configuration is consistent with a vanishing, or nearly vanishing, radial drift, is also investigated. It is found that omnigenity does not occur in the vicinity of the magnetic axis. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-14001 Harvard Univ., Cambridge, Mass.
RESISTANCE RISE IN ULTRATHIN METALLIC WIRES AT LOW TEMPERATURES Ph.D. Thesis
Alice Elizabeth White 1982 203 p
Avail: Univ. Microfilms Order No. DA8222716

New measurements of the low temperature resistance rise in ultrathin wires and films of copper, AuPd alloy, and nickel are reported. The wires, which have cross-sectional dimensions as small as 220 A x 200 A, are fabricated using a versatile step-edge shadowing technique. The dimensions of the wires can be precisely determined by easily-controlled fabrication parameters such as thin film thickness and shadowing angle. In order to verify the dimensions and integrity of the wires, a convenient and reliable technique for thinning the substrate was developed. This allows nondestructive examination of the structures by high resolution transmission electron microscopy. A similar technique to investigate grain sizes of thin metal films was used. The theoretical models for the low temperature resistance rise in samples of reduced dimensionality are usually classed as based on one-electron 'localization' or many-electron 'interaction' effects. Our experimental results for copper, AuPd alloy, and nickel wires accurately confirm the proportionality to 1/sq root of T predicted by the interaction model of Altshuler, Khmel'nitzkii, Larkin, and Lee. Moreover, we find that our results of a careful reanalysis of the data already in the published literature give an absolute magnitude consistent within a factor of 2 with the quantitative predictions of this model, using independently determined parameters. Dissert. Abstr.

N83-14002# New South Wales Univ., Kensington (Australia). Dept. of Applied Physics.
INVESTIGATION OF INTERFACIAL PROPERTIES OF ALKALI HALIDES Ph.D. Thesis
Nicholas George Cutmore Jan. 1981 255 p refs Sponsored in part by Australian Dept. of Education
Avail: NTIS HC A12/MF A01

Two alkali halides were investigated in order to clarify the role that the interface plays in determining important mechanical and transport properties of alkali halides. NaCl bicrystals containing a single planar tilt boundary were prepared by the split seed method, and their grain boundary region studied by means of gold decoration and microhardness methods. Transmission electron microscopy on gold decorated cleavage surfaces of nominally pure and calcium doped NaCl bicrystals revealed the distribution of both segregated calcium second phase about the grain boundary. Different calcium precipitate types were identified by the gold decoration method, and optical microscopy on bicrystals opened along the boundary revealed a correlation between calcium concentration in the boundary region, and the preference for a particular precipitate type at this site. S.L.

N83-14003*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SYSTEM FOR MEASURING THERMAL ACTIVATION ENERGY LEVELS IN SILICON BY THERMALLY STIMULATED CAPACITANCE
R. H. Cockrum 15 Sep. 1982 40 p refs
(Contract DE-AI01-76ET-20356)
(NASA-CR-169516; DOE/JPL-1012-78; JPL-5101-217; JPL-Pub-82-82; NAS 1.26:169516) Avail: NTIS HC A03/MF A01 CSCL 20L

One method being used to determine energy level(s) and electrical activity of impurities in silicon is described. The method is called capacitance transient spectroscopy (CTS). It can be classified into three basic categories: the thermally stimulated capacitance method, the voltage-stimulated capacitance method, and the light-stimulated capacitance method; the first two categories are discussed. From the total change in capacitance and the time constant of the capacitance response, emission rates, energy levels, and trap concentrations can be determined. A major advantage of using CTS is its ability to detect the presence of electrically active impurities that are invisible to other techniques, such as Zeeman effect atomic absorption, and the ability to detect more than one electrically active impurity in a sample. Examples of detection of majority and minority carrier traps from gold donor and acceptor centers in silicon using the capacitance transient spectrometer are given to illustrate the method and its sensitivity. M.G.

N83-14004# Rolls-Royce Ltd., Derby (England).
PROCESSING ANTHRACENE SINGLE CRYSTALS
S. Ujhelyi Nov. 1981 4 p ref Transl. into ENGLISH from Magyar Fizikai Folyoirat (Hungary), v. 5, no. 1, 1957 p 71-72
(PNR-90135; Trans-15992; TLT-00853) Avail: NTIS HC A02/MF A01

A mechanical-chemical process for cutting anthracene crystals is described. A thread, soaked in toluene, dissolves a thin layer away from the material. The crystal is fixed to a metal platform placed between the two spools which wind the thread. The thread is not allowed to tighten as it crosses the crystal. For polishing, the slices are bonded with a gelatin solution onto a plexiglass disk, and rubbed with fine silk wetted with toluene. When one side is done the disk is immersed in water (room temperature) and soaks until the crystal can be removed, and the other side can be done. If the crystal splits in two, it can be rejoined using Canada balsam. Author (ESA)

N83-14005# Battelle Inst., Frankfurt am Main (West Germany).
CRYSTAL GROWTH OF LEAD-TIN TELLURIDE BY THE TRAVELING HEATER METHOD Final Report, Dec. 1981
Wolfgang Kottler and Dieter Langbein Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-018; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,50

A single PbTeSn crystal 1cm long, 15mm diameter was grown in a mirror oven, confirming that the Spacelab ellipsoid oven can produce good quality, homogeneous material by the traveling heater method. A theoretical model was developed, enabling calculations of temperature and concentration profiles, of forms of melting and growth fronts, and of convection profile under normal and reduced gravity. The mutual influence of temperature and convection profiles is treated iteratively. The model is conceived in such a manner that other THM growth experiments and other heaters can be treated as well. Author (ESA)

N83-14006# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).
APPLICATION AND FURTHER DEVELOPMENT OF ION IMPLANTATION FOR VERY LARGE SCALE INTEGRATION, PART 1 Final Report, Mar. 1981
Heiner Ryssel, Josef Goetzlich, Karl Haberger, Gertraud Prinke, and Klaus Hoffmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 152 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-82-119-Pt-1; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

The suitability of ion implantation for silicon doping was investigated. Structure size, nondoping implantation applications, and influencing oxidation rate by implantation, and with radiation-enhanced diffusion, were considered. One dimensional and two dimensional process simulation programs, and a technique for local oxidation using nitrogen implantation were developed. Tapered oxide windows were etched by ion implantation-produced radiation damage. By means of high energy implantation, it is possible to produce buried isolating and conducting layers with good electrical properties. Author (ESA)

N83-14007# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
COPLANAR AND SLOW-WAVE GaAs MONOLITHIC COUPLERS
E. M. Bastida, G. P. Donzelli, and N. Fanelli 1981 23 p refs Presented at IEEE GaAs Integrated Circuits Symp., San Diego, Calif., 27-29 Oct. 1981
(CISE-1755) Avail: NTIS HC A02/MF A01

The possibility of reduction of distributed element size in monolithic GaAs circuits is discussed. Design data are given for broadband low-coupling coplanar hybrids, and the performance of an experimental coplanar waveguide coupler constructed on semi-insulating GaAs is described. A slow-wave solution is presented to reduce the coupler length, and the use of the slow-wave concept in monolithic circuits is analyzed. A slow-wave coupler design procedure is reported and the problem of input-output coupler matching is discussed. Construction and performances of a -3 dB and of a -6dB quarter wave-length slow-wave coupler are described. Author (ESA)

N83-14008# Science Research Council, Chilton (England).
COMPUTER SIMULATION CALCULATIONS FOR ONE-DIMENSIONAL MAGNETIC SYSTEMS, WITH SOME REMARKS ON OPTIMISATION ON THE CRAY COMPUTER
J. M. Loveluck and E. Balcar (Arominst. der Oesterreichischen Univ.) 1982 19 p refs
(PB82-226622; RL-82-022) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20L

Some of the novel aspects of the spin dynamics of one-dimensional magnetic systems are illustrated by a review of some recent studies of such systems. Emphasis is laid on the role played by computer simulation calculation in understanding the fundamental mechanisms, and advances in the simulation technique for

magnetic systems are described. The impact, both actual and potential, of fast vector processors, such as the CRAY computer, is assessed, with reference to specific figures for increases in computational speed. (Copyright (c) Science and Engineering Research Council 1982.) Author (GRA)

N83-14009# Science Research Council, Chilton (England).
MAGNETIC EXCITATIONS IN THE ISING-HEISENBERG CHAIN AT LOW TEMPERATURES
S. W. Lovesey and Margaret Hood (Southampton Univ.) 1982 18 p refs
(PB82-226630; RL-82-026) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20L

The spectral weight of transverse spin fluctuations in the Ising-Heisenberg chain is calculated in the limit of low temperatures. The spin Hamiltonian contains three forms of anisotropy; an external magnetic field and exchange and single site anisotropy. Single spin wave and bound state contributions to the spectral weight are studied as functions of the various types of anisotropy, with particular attention to features of the spectrum that can be measured by inelastic neutron scattering. Author (GRA)

N83-14010# National Bureau of Standards, Boulder, Colo. Engineering Lab.
ELECTRICAL PROPERTIES OF MATERIALS AND THEIR MEASUREMENT AT LOW TEMPERATURES
F. R. Flickett Mar. 1982 78 p refs Sponsored in part by DOE
(PB82-227877; NBS-TN-1053) Avail: NTIS HC A05/MF A01 CSCL 20L

A review is given of the electrical resistivity of materials at cryogenic temperatures. Measurement techniques, the data base, and uses of the data are presented. The emphasis is on metals and alloys of technological importance, a topic which covers a large range of materials. Theory and experiment relating to single crystals or thin films are mentioned only when the information leads to a better understanding of the technologically important metals. The treatment of theory and of measurement techniques is primarily for the user interested in the more practical aspects of the subject. In every instance, however, references are given which allow the reader to pursue the subject at any level. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-14011# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
NONEXPONENTIAL DECAY IN RELAXATION PHENOMENA Final Report, 10 Feb. - 9 Aug 1982
A. K. Rajagopal, K. L. Ngai, R. W. Rendell, and S. Teitler 9 Aug. 1982 12 p refs
(Contract N00014-82-K-2021)
(AD-A119087) Avail: NTIS HC A02/MF A01 CSCL 20/10

A variety of considerations from different points of view including non-Markoffian stochastic processes, basic quantum mechanics and a mechanism based on condensed matter physics, all lead to the fractional exponential decay at long times in relaxation processes. Implications of this decay law and its verifiable predictions in a broad range of phenomena in condensed matter physics are pointed out. Author (GRA)

N83-14012# Science Research Council, Chilton (England).
GRAND UNIFICATION WITH LARGE SUPERSYMMETRY BREAKING
J. Ellis, L. Ibanez, and G. G. Ross 1982 15 p refs
(PB82-226614; RL-82-024) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20J

General criteria are given for the magnitudes of mass splittings between supersymmetric partners compatible with the desired hierarchy of mass scales in grand united theories (GUTs). These splittings arise naturally when masses are generated radiatively from a Higgs sector breaking supersymmetry through the O'Raifeartaigh mechanism. Explicit GUTs are developed in which the supersymmetry breaking scale may easily be as large as the Planck mass. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-14013# Leadership and Management Development Center, Maxwell AFB, Ala. Directorate of Research and Analysis.
FACTOR STABILITY OF THE ORGANIZATIONAL ASSESSMENT PACKAGE Final Report
Janice M. Hightower and Lawrence O. Short Aug. 1982 139 p refs
(AD-A119122; LMDC-TR-82-1) Avail: NTIS HC A07/MF A01 CSCL 05/1

The Organizational Assessment Package (OAP) is currently undergoing a complete factor-by-factor revision. A part of this effort is reexamining the validity of the survey instrument in the light of data and experience gained from two years of field use. Specifically, this study concerned the consistency of OAP factorial validity across both functional area and demographic groupings. Three measures of factor consistency were used: congruence coefficient, s-index, and root mean square. Results showed excellent and consistent factor solutions across groups and methods of measurement. Author (GRA)

N83-14014# Naval Personnel Research and Development Center, San Diego, Calif.
EXPECTANCY THEORY MODELING
Paul Horst Aug. 1982 255 p refs
(NR Proj. 040-110; ZR00001042)
(AD-A119128; NPRDC-TR-82-56) Avail: NTIS HC A12/MF A01 CSCL 12/2

An objective of this effort was to reformulate expectancy theory in organizational behavior in objective terms and measurable concepts, employing sound multivariate models. Although a vast amount of literature in organizational behavior has been generated by expectancy theory since 1964, this literature has not been substantially influenced by the traditional models of multivariate analysis. Further development and application of expectancy theory requires a better methodological and mathematical foundation than is currently provided. The history, terms, and concepts of expectancy theory are examined. The basic concepts of multivariate analysis models are discussed and applied to develop a more adequate expectancy theory model. Criticisms of present models and their postulates and assumptions are addressed. Measurement problems are solved by the development of analytical models that will accept data more easily obtained from subjects. Recommendations are made regarding empirical tests of the models. Author (GRA)

N83-14015# National Academy of Sciences - National Research Council, Washington, D. C. Subcommittee on Postperformance Evaluation of Research.
THE QUALITY OF RESEARCH IN SCIENCE Final Report

Mar. 1982 125 p refs
(Grant NSF EVL-81-15789)
(PB82-221755) Avail: NTIS HC A06/MF A01 CSCL 05A

Pursuant to a mandate by the Senate Appropriations Committee for the development of methods that the National Science Foundation (NSF) could use to carry out postperformance evaluation of the research it supports, seven specific activities were recommended to NSF, including improved use and articulation of evaluative information already being collected. The evaluation of basic research in industry, review practices in scientific journals, studies on the evaluation of scientific research, and a site-visit report on NSF's current evaluation practices are discussed. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-14016*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY, 1981
15 Sep. 1982 39 p Sponsored by NASA
(NASA-CR-169519; JPL-Bibl-39-23; NAS 1.26:169519) Avail: NTIS HC A03/MF A01 CSCL 05B

Over 500 externally distributed technical reports released during 1981 that resulted from scientific and engineering work performed, or managed by Jet Propulsion Laboratory are listed by primary author. Of the total number of entries, 311 are from the bimonthly Deep Space Network Progress Report, and its successor, the Telecommunications and Data Acquisition Progress Report. A.R.H.

N83-14017# Naval Ship Research and Development Center, Bethesda, Md.
INFORMATION SYSTEMS DESIGN METHODOLOGY: GLOBAL LOGICAL DATA BASE DESIGN Final Report, Jun 1981 - May 1982
David K. Jefferson Aug. 1982 63 p refs
(AD-A119089; DTNSRDC-82/057) Avail: NTIS HC A04/MF A01 CSCL 09/2

The methodology includes a detailed notation and procedures for developing a data base design that satisfies many applications, is adaptable to changes in applications, and is independent of specific hardware and software. The methodology is supported by the problem statement language/problem statement analyzer, a computer-based tool for developing information systems. Author (GRA)

N83-14018# Alpha Omega Group, Inc., Silver Spring, Md.
DEVELOPMENT OF A USER-ORIENTED DATA CLASSIFICATION FOR INFORMATION SYSTEM DESIGN METHODOLOGY Final Report, 1 Jan. - 30 Jun; 1982
30 Jun. 1982 130 p refs
(Contract N00014-82-C-0129)
(AD-A118879; AOG82-ONR-1) Avail: NTIS HC A07/MF A01 CSCL 05/2

A comprehensive review of information system design methodologies demonstrates that there is a need for new and improved approaches, particularly in the early stages of system design. Specifically, a methodology is needed that will collect and organize data from and about the information environment in order to present a coherent, systematic, and dynamic picture of an enterprise and its activities that will support the development of requirements statements, and later, database and data dictionary design and/or use. GRA

N83-14019# National Telecommunications and Information Administration, Washington, D.C.
PRIVACY PROTECTION LAW IN THE UNITED STATES
Robert Aldrich May 1982 108 p refs
(PB82-231440; NTIA/Rept-82-98) Avail: NTIS HC A06/MF A01 CSCL 05B

Privacy law in the United States is characterized by unusual diversity as compared with the unitary schemes of regulation adopted by many countries of continental Europe. This report is not intended to be an exhaustive survey of U.S. laws. Instead, the purpose of the report is to illustrate the salient categories of privacy law in the United States, and to explain some of the factors contributing to its great variety and its differential treatment of governmental and private information practices. Particularly for readers who are unfamiliar with the development of U.S. privacy law, an awareness of its varied roots and diverse functions may help in understanding how this complex body of law applies to specific privacy problems and to implementation of the Guidelines principles. Author (GRA)

N83-14020# Bureau of Mines, Washington, D. C. Minerals Data Working Group.
MINERALS DATA SOURCE DIRECTORY
May 1982 302 p
(PB82-235516; BM-IC-8881; LC-82-600142) Avail: NTIS HC A14/MF A01 CSCL 05B

A compilation of descriptive information on the availability, content, and location of minerals data in the Federal Government is provided. It is intended to assist Government Personnel and the general public in locating and acquiring minerals information. Included in the Directory are descriptions of data bases, publications, information systems, and information offices containing data pertaining to all aspects of mineral production, consumption, trade, and related information. These mineral data sources include the Federal agencies such as the Department of the Interior's Bureau of Mines and Geological Survey whose major mission is the collection and dissemination of mineral information. Author (GRA)

N83-14021# Bionetics Corp., Hampton, Va.
CARBON FIBER DATA BASE: DATA BASE REVIEW AND ASSESSMENT OF CARBON FIBER RELEASE INTO THE ENVIRONMENT Final Report, 13 Aug. 1979 - 30 Sep. 1980
Mar. 1982 244 p refs
(Contract EPA-68-03-2848)
(PB82-235027; EPA-600/2-82-038) Avail: NTIS HC A11/MF A01 CSCL 05B

The eventual disposal of carbon fiber composites in municipal waste streams is addressed. A survey of current literature presents the effects of fires on carbon fiber composites, the effects of airborne carbon fibers including incidents of electrical failures, applications of composites, the direction of current research and the present manufacturers of both fiber and composites. A bibliograhy lists the pertinent publications and data sources. Reviews of Federal carbon fiber programs include those concerned with fire accidents, the effects of airborne fibers and the development of measurement techniques for airborne carbon fibers. The sources of carbon fiber composites entering municipal waste streams are identified, the capabilities of solid waste disposal techniques have been evaluated and includes an estimate for a potential release of airborne carbon fibers from municipal incinerators. The Federal Agencies involved in carbon fiber studies are listed together with their coordinator or principal investigators. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N83-14022*# Operations Research, Inc., Silver Spring, Md.
GOVERNMENT FINANCIAL SUPPORT FOR CIVIL AIRCRAFT RESEARCH, TECHNOLOGY AND DEVELOPMENT IN FOUR EUROPEAN COUNTRIES AND THE UNITED STATES Final Report
B. Chandler, R. Golaszewski, C. Patten, B. Rudman, and R. Scott 1 Apr. 1980 93 p refs Prepared in cooperation with Gellman Research Associates, Inc.
(Contract NASw-2961)
(NASA-CR-169537; NAS 1.26:169537) Avail: NTIS HC A05/MF A01 CSCL 05D

Data on the levels of government financial support for civil aircraft airframe and engine (CAAE) research and technology (R&T) in the United States and Europe (United Kingdom, West Germany, France and The Netherlands) and means of comparing these levels are provided. Data are presented for the years 1974-1977. European R&T expenditure data were obtained through visits to each of the four European countries, to the Washington office of the European Communities, and by a search of applicable literature. CAAE R&T expenditure data for the United States were obtained from NASA and Federal Aviation Administration (FAA). Author

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-14023# OAO Corp., Greenbelt, Md.
HARMONIC CHARACTERISTICS OF RECTIFIER SUBSTATIONS AND THEIR IMPACT ON AUDIO FREQUENCY TRACK CIRCUITS Final Report, 15 Jan. - 15 Jul. 1981
Vilas D. Nene May 1982 57 p refs
(Contract DTRS57-81-C-00033)
(PB82-229659; UMTA-MA-06-0025-81-6; DOT-TSC-UMTA-81-75)
Avail: NTIS HC A04/MF A01 CSCL 13F

The basic operation of substation rectifier equipment is described as well as the modes of possible interference with audio frequency track circuits used for train detection, cab signaling, and vehicle speed control. Methods of estimating EM noise received by track circuits from substation operation are included. GRA

N83-14024# OAO Corp., Greenbelt, Md.
THE STATUS OF ADVANCED PROPULSION TECHNOLOGY IN JAPAN Final Report, 15 Jan. - 15 Jul. 1981
Vilas D. Nene Washington Urban Mass Transportation Administration Mar. 1982 83 p refs
(Contract DTRS-57-81-C-00033)
(PB82-229642; UMTA-MA-06-0025-81-5; DOT-TSC-UMTA-81-76)
Avail: NTIS HC A05/MF A01 CSCL 13F

This report describes the efforts of the Japanese transit industry, which includes manufacturers and transit operators, in the area of advanced propulsion systems for urban rail veicles. It presents different chopper system designs, new ac drive developments, various commercial frequency and audio frequency signalling systems, investigation of potential electromagnetic interference problems, and possible countermeasures. Six Japanese transit systems using chopper cars are described in some detail in Appendix A and a widely used commutation circuit of these choppers is described in Appendix B. Other related topics, such as equipment reliability and maintenance, are also discussed.

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-14025 Washington Univ., St. Louis, Mo.
THE INFRARED SPECTRUM OF ETA CARINAE: COSMIC RAY HEATING OF CIRCUMSTELLAR DUST Ph.D. Thesis
James Martin Borgwald 1982 256 p
Avail: Univ. Microfilms Order No. DA8223764

The history and current observations of the unusual southern sky nebula, Eta Carinae, are reviewed. The infrared luminosity arises from a thick dust shell surrounding an energetic central object. A critical analysis of the conventional model of a bright, massive, central star is presented. It is shown that the amount of dust required for the infrared luminosity provides too great an optical depth for the observed visible and ultraviolet luminosity to be understood as radiation emitted by the central star and penetrating the dust shell. A central source of cosmic ray protons is proposed to heat the dust grains via the excitation of lattice electrons during proton-dust grain collisions. The predicted infrared spectrum is compared with observations for a range of parameters for the proton energy; dust grain size and composition; and dust shell boundaries and temperature and density distributions. With the constraint of the total infrared luminosity, the central source energy in protons is estimated using the Bethe-Bloch formula for stopping power. Although the proton luminosity is large, cosmic ray heating is shown to be a plausible mechanism for producing the infrared radiation from Carinae. Secondary effects of the model are examined. The most important is visible synchrotron emission arising from high energy electrons. Dissert. Abstr.

N83-14026 Washington Univ., St. Louis, Mo.
INTERPRETATION OF THE 6815 A BAND OF METHANE OBSERVED IN THE MAJOR PLANETS Ph.D. Thesis
Kevin Hays Baines 1982 185 p
Avail: Univ. Microfilms Order No. DA8223762

High resolution spectra of the 6815 band of methane were obtained for Jupiter, Saturn, Uranus, and Neptune. A curve of growth analysis yields initial estimates for the effective pressure level, methane abundance, and methane mixing ratio for each of the outer planets. It is indicated that features observed within Jupiter and Saturn are formed at relatively high altitudes, while Uranus and Neptune indicate effective pressure levels of three to four Earth atmospheres. A factor of three enhancement of methane throughout the outer solar system is indicated. More complex models are calculated which account for vertical inhomogeneities, and which also are constrained to complementary observations. It is shown that the aerosol content within Saturn's northern temperate region is substantially different from that at the equator, indicating a haze only half as optically thick. Synthetic line profiles of the 6818.9 observed in Uranus reveal a substantial stratospheric haze exists with an optical thickness eight times greater than previously reported. The mixing ratio of methane in the deep atmosphere is some 4%, indicates that methane comprises more than 30% of the Uranian atmosphere by weight. Dissert. Abstr.

N83-14027 Wisconsin Univ., Madison.
FIELD HORIZONTAL BRANCH STARS AT ULTRAVIOLET AND

VISUAL WAVELENGTHS Ph.D. Thesis
David Paul Huenemoerder 1982 93 p
Avail: Univ. Microfilms Order No. DA8218016

The spectra of 17 field horizontal branch (FHB) stars as available from the International Ultraviolet Explorer (IUE) data at Washburn Observatory, and spectra of the same objects obtained at Pine Bluff Observatory (PBO) have been analyzed and compared to spectra of normal population I stars obtained with the same instruments, and to recent blanketed model atmospheres. The spectral range covered was 1100A - 3200A at 5A resolution and 3700A - 5800A at 8A resolution. The weakness of FHB spectral features in the UV as well as in the visual indicates low metallicity. Temperatures and/or gravities have been derived for both groups of stars using UV and visual colors as well as integrated flux. The temperatures obtained from the UV and visual part of the spectra agree reasonably well with each other and with previously published values based on both UV and visual analyses. The gravities found for the cooler FHB stars (from Strongren photometry, since the UV spectrum is insensitive to gravity) are smaller than those of the population I stars of similar temperature. Dissert. Abstr.

N83-14028 Harvard Univ., Cambridge, Mass.
A FAR-INFRARED SURVEY OF THE GALACTIC CENTER Ph.D. Thesis
Sten Felix Odenwald 1982 232 p
Avail: Univ. Microfilms Order No. DA8222562

A large scale, high resolution, far infrared survey of the galactic center is presented. An 8.5 square degree field centered on Sgr-A was mapped at a resolution of 1 arcminute using a 40 to 250 micron, helium-cooled, Ga:Ge bolometer with a 3-sigma flux limit of 400 Jy/beam area and a NEFD of 85 Jy Hz to the .00005 power. Forty seven far infrared sources of which thirty-seven are probably indigenous to the galactic center were detected. Of these, 21 are coincident in angle with radio continuum sources. The members of this group have luminosities between 50,000 and 1,000,000 L sub O, average infrared excesses of 16 and have average dust to gas ratios of .002, comparable to the values seen in ordinary spiral arm HII regions. The integral luminosity function for these 21 sources is best fit by an exponential with a scaling luminosity of 260,000 L sub O. Each appears to be powered by small numbers of early O type stars. Dissert. Abstr.

N83-14029 Columbia Univ., New York.
THE DEVELOPMENT OF AN X-RAY IMAGING PROPORTIONAL COUNTER AND AN ANALYSIS OF TYCHO'S SUPERNOVA REMNANT Ph.D. Thesis
Paul Brian Reid 1982 327 p
Avail: Univ. Microfilms Order No. DA8222475

A soft X-ray imaging proportional counter was developed for use in X-ray astronomy. The detector, a drift multiwire proportional counter, determines the position of the site of X-ray absorption in the detector in two orthogonal directions using the center-of-gravity centroid determination technique. Spatial resolutions of 0.2 millimeters full width at half maximum and 0.5 millimeters full width at half maximum were obtained at X-ray energies of 0.94 and 0.28 kiloelectron volts, respectively. The detector and processing electronics were integrated into a rocket-borne X-ray telescope payload. The X-ray imaging observations of Tycho's supernova remnant were obtained with the Einstein Observatory imaging proportional counter. The remnant appears as an incomplete shell of radius 3.5 parsecs in the adiabatic phase of evolution. The X-ray and radio shells are spatially coincident, although uncorrelated in intensity. The luminosity at a distance of 3 kiloparsecs is (5.3 + or - 1.3) x 10 to the 36th power ergs per second. The current shock velocity is 3400 + or - 140 kilometers per second. Initial blast energy and ejected mass estimates are also given.
Dissert. Abstr.

N83-14030# Camerino Univ. (Italy). IAU-Commission 24 Working Group.
OPTICAL/RADIO ASTROMETRIC SOURCES FOR THE ESTABLISHMENT OF AN INERTIAL REFERENCE FRAME Progress Report
A. N. Argue, ed. and Chr. deVegt, ed. (Hamburger Sternwarte) 1982 79 p refs
(ISSN-0374-1583) Avail: NTIS HC A05/MF A01

Suitable extragalactic sources were selected to contribute to establishing an inertial reference frame by radio and optical astrometry. The standard coordinate reference frame for celestial objects is made accessible to the observer via the positions and proper motions for 1535 fundamental stars given in the Fourth Fundamental Catalogue FK4 (Fricke and Kopff, 1963). These stars are bright, are fairly evenly distributed over the sky, and have substantial observational histories extending well back to before the beginning of the present century. The reductions to the standard equator and equinox were carried out using a clearly defined set of constants for precession, mutation and aberration. L.F.M.

N83-14031# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
IMAGING TECHNIQUES AND REMOTE SENSING OF ASTROPHYSICAL OBJECTS USING MILLIMETER MICROWAVES [TECNICAS DE IMAGEAMENTO E SENSORIAMENTO REMOTO DE OBJETOS ASTROFISICOS EM MICRO-ONDAS MI LIMETRICAS]
Z. Abraham, J. E. R. Costa, and P. Kaufmann Sep. 1982 11 p In PORTUGUESE Submitted for publication
(INPE-2537-PRE/200) Avail: NTIS HC A02/MF A01

A technique for mapping astrophysical objects with millimeter microwaves and using image processing techniques used in remote sensing is described. Combination of the two techniques provides an image of the structure of astrophysical objects in a form produced by no other method. The mapping was performed using the large 14 m microwave antenna at Itapetinga at frequencies of 22 and 44 GHz. The data software is produced in a I-100 computer using the SERE program. The data were converted into temperature form and the temperatures associated with five colors, each divided into seven color tones from red to violet in ascending temperatures. Image of the Galactic center and of the active and quiescent Sun are presented. Transl. by J.D.

N83-14032*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OBSERVATIONS OF THE 145.5 MICRON (OI) EMISSION LINE IN THE ORION NEBULA
Gordon Stacey, Scott Smyers, Noel Kurtz, and Martin Harwit Nov. 1982 22 p refs Submitted for publication Prepared in cooperation with Cornell Univ., Ithaca, N.Y.
(Grants NsG-2347; NGR-33-010-146)
(NASA-TM-84307; A-9155; NAS 1.15:84307) Avail: NTIS HC A02/MF A01 CSCL 03A

A first set of observations of the (OI) 3P to 3P1 (145.5 micron) transition was obtained. The line was observed both in a beam centered on the Trapezium, and in a 7 times wider beam encompassing most of the Orion Nebula. A wide beam map of the region was constructed which shows that most of the emission is confined to the central regions of the nebula. These observations may be compared with reported measurement of the 3P1 to 3P2 (63.2 micron) transition in Orion and are consistent with optically thin emission in the 145.5 micron line and self-adsorbed 63.2 micron emission lines. Mechanisms are discussed for the excitation of neutral oxygen. It is included that much of the observed emission originates in the thin, radio-recombination-line-emitting CII/HI envelope bordering on the HII region. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-14033*# Wisconsin Univ., Madison. Dept. of Physics.
POSSIBLE CONTRIBUTIONS OF SUPERNOVA REMNANTS TO THE SOFT X-RAY DIFFUSE BACKGROUND (0.1 - 1keV)
W. T. Sanders, D. N. Burrows, D. McCammon, and W. L. Kraushaar Oct. 1982 6 p refs Presented at the I.A.U. Symp. 101 Supernova

Remnants and Their X-ray Emission, Venice, 30 Aug. - 2 Sep. 1982
(Grant NGL-50-002-044)
(NASA-CR-169524; NAS 1.26:169524; WU-168) Avail: NTIS HC A02/MF A01 CSCL 03B

Almost all of the B band (0.10-0.19 keV) and C band (0.15-0.28 keV) X-rays probably originate in a hot region surrounding the Sun, which Cox and Anderson modeled as a supernova remnant. This same region may account for a significant fraction of the M band (0.5-1 keV) X-rays if the nonequilibrium models of Cox and Anderson are applicable. A population of distant SNR similar to the local region, with center-to-center spacing of about 300 pc, could provide enough galactic M band emission to fill in the dip in the count rate in the galactic plane that would otherwise be present due to absorption of both the extra galactic power law flux and any large-scale-height stellar (or galactic halo) emission. Author

N83-14034*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE X-RAY ABSORPTION SPECTRUM OF 4U1700-37 AND ITS IMPLICATIONS FOR THE STELLAR WIND OF THE COMPANION HD153919
N. E. White, T. R. Kallman (MIT, Cambridge), and J. H. Swank Aug. 1982 32 p refs Submitted for publication
(Contract NAS8-30752)
(NASA-TM-83976; NAS 1.15:83976) Avail: NTIS HC A03/MF A01 CSCL 03B

The first high resolution non-dispersive 2-60 KeV X-ray spectra of 4U1700-37 is presented. The continuum is typical of that found from X-ray pulsars; that is a flat power law between 2 and 10 keV and, beyond 10 keV, an exponential decay of characteristic energy varying between 10 and 20 keV. No X-ray pulsations were detected between 160 ms and 6 min with an amplitude greater than approximately 2%. The absorption measured at binary phases approximately 0.72 is comparable to that expected from the stellar wind of the primary. The gravitational capture of material in the wind is found to be more than enough to power the X-ray source. The increase in the average absorption after phi o approximately 0.5 is confirmed. The minimum level of adsorbption is a factor of 2 or 3 lower than that reported by previous observers, which may be related to a factor of approximately 10 decline in the average X-ray luminosity over the same interval. Short term approximately 50% variations in adsorption are seen for the first time which appear to be loosely correlated with approximately 10 min flickering activity in the X-ray flux. These most likely originate from inhomogeneities in the stellar wind of the primary. Author

N83-14035# Cambridge Univ. (England). Dept. of Engineering.
JAMES CLERK MAXWELL'S CAMBRIDGE MANUSCRIPTS: EXTRACTS RELATING TO CONTROL AND STABILITY, 2
A. T. Fuller 1981 64 p refs
(PB82-182791; CUED/F-CAMS/TR-219-1981; ISSN-0309-765X) Avail: NTIS HC A04/MF A01 CSCL 03C

Maxwell's manuscripts held at Cambridge University Library contain several items of interest from a control or stability point of view. The extract reproduced in Part II consists of a draft of the first half of Maxwell's essay on the stability of the motion of Saturn's rings. Historical notes are added on the development of stability theory before Maxwell's essay. Author (GRA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N83-14036* Stanford Univ., Calif. Dept. of Computer Science.
VIKING LANDER ATLAS OF MARS Final Report
Sidney Liebes, Jr. Washington NASA 1982 290 p refs
(Contracts NAS1-9682; JPL-955249; Grants NsG-7538; NAGw-128)
(NASA-CR-3568; NAS 1.26:3568) Avail: NTIS HC A13 CSCL 03B

Half size reproductions are presented of the extensive set of systematic map products generated for the two Mars Viking landing sites from stereo pairs of images radioed back to Earth. The maps span from the immediate foreground to the remote limits of ranging capability, several hundred meters from the spacecraft. The maps are of two kinds - elevation contour and vertical profile. Background and explanatory material important for understanding and utilizing the map collection included covers the Viking Mission, lander locations, lander cameras, the stereo mapping system and input images to this system. A.R.H.

N83-14037 Academy of Sciences (USSR), Moscow. Space Research Inst.
FORMATION OF PLASMA MANTLE IN THE VENUSIAN MAGNETOSPHERE
L. M. Zeleny and O. L. Vaisberg 1982 39 p refs
(Pr-731) Copyright. Avail: Issuing Activity

A model of the interaction of the solar wind with Venus is proposed which includes magnetic barrier formation, ionopause properties, plasma dynamics in the magnetic barrier, and the formation of the Venus wake. It is shown that the ionopause is practically an equipotential boundary and its current is determined by a diamagnetic drift. The source of the plasma mantle can be provided by photoions appearing in the magnetic barrier and convecting towards the wake due to magnetic pressure gradient and to magnetic tension. Formation of the magnetic wake is determined by convection of magnetic barrier field tubes in which the solar wind plasma is replaced by ions of planetary origin. The proposed model overestimates values of nonconnective velocity and magnetic barrier thickness near the terminator. It underestimates the values of number density and magnetic field strength in the wake which suggest the possible influence of anomalous ionization in the solar wind-Venus interaction process. Author

N83-14038 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE OBLATENESS EFFECT ON THE SOLAR RADIATION INCIDENT AT THE TOP OF THE ATMOSPHERE OF THE OUTER PLANETS
E. vanHemelrijck 1982 38 p refs Submitted of publication
(Aeronomica-Acta-A-243-1982) Avail: Issuing Activity

Seasonal and latitudinal variations of the daily solar radiation incident at the top of the atmospheres of Jupiter, Saturn, Uranus and Neptune, with and without the effect of the oblateness, were calculated. For parts of the summer, the daily insolation of an oblate planet is increased, the zone of enhanced solar radiation being strongly dependent upon the obliquity whereas the rate of increase is fixed by both the flattening and the obliquity. In winter, the oblateness effect results in a more extensive polar region, the daily solar radiation of an oblate planet being always reduced when compared to a spherical planet. The mean summer daily insolation is increased between the equator and the subsolar point, but decreased poleward of the above mentioned limit. In winter, however, the horizon plane is always tilted away from the Sun, causing the mean winter daily insolation to be reduced.
Author (ESA)

N83-14039*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
TITA: DISCOVERY OF CARBON MONOXIDE IN ITS ATMOSPHERE
Barry L. Lutz, Catherine deBergh (Observatoire de Meudon), and Tobias Owen (State Univ. of New York, Stony Brook) 1982 12 p refs Submitted for publication
(Grant NsG-7499)
(NASA-CR-169540; NAS 1.26:169540) Avail: NTIS HC A02/MF A01 CSCL 03B

The 3-D rotation-vibration band of carbon monoxide was identified in the near-infrared spectrum of Titan. A preliminary mixing ratio of CO/N2 = 0.00006 was determined. This result

supports the probable detection of CO2 by Samuelson et al and strengthens possible analogies between the atmosphere of Titan and conditions on the primitive Earth. Author

N83-14040*# Herzberg Inst. of Astrophysics, Ottawa (Ontario).
METEORS AND METEOR SPECTRA ANALYSIS Final Report
Peter M. Millman 30 Sep. 1982 27 p refs
(NASA Order H-43052-B)
(NASA-CR-170677; NAS 1.26:170677) Avail: NTIS HC A03/MF A01 CSCL 03A

Studies on meteor spectroscopy are reported. The following topics are discussed: photometric spectra of 17 meteors; the chemistry of cometary meteoroids; and current trends in meteor spectroscopy. For individual titles, see N83-14041 through N83-14043.

N83-14041*# Herzberg Inst. of Astrophysics, Ottawa (Ontario).
ANALYSIS OF PHOTOMETRIC SPECTRA OF 17 METEORS Final Report
Peter M. Millman *In its* Meteors and Meteor Spectra Anal. 30 Sep. 1982 9 p refs (For primary document see N83-14040 04-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The initial phase of the photometry which involved 17 meteor spectra consisting of eight Geminid spectra, six Orionid spectra and three Eta Aquarid spectra is discussed. Among these 17 spectra it is found that the Geminid spectra are of the best quality and are used for the identification of the atomic lines and molecular bands that normally appear on video tape spectra. The data from the Geminid records are used for developing calibration techniques in photometry. The Orionid and Eta Aquarid spectra are chosen for early analysis because of the current interest in all physical and chemical data relating to Comet Halley. E.A.K.

N83-14042*# Herzberg Inst. of Astrophysics, Ottawa (Ontario).
CHEMISTRY OF COMETARY METEOROIDS FROM VIDEO-TAPE RECORDS OF METEOR SPECTRA Progress Report
Peter M. Millman *In its* Meteors and Meteor Spectra Anal. 30 Sep. 1982 11 p refs (For primary document see N83-14040 04-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The chemistry of the cometary meteoroids was studied by closed circuit television observing systems. Vidicon cameras produce basic data on standard video tape and enable the recording of the spectra of faint shower meteors, consequently the chemical study is extended to smaller particles and we have a larger data bank than is available from the more conventional method of recording meteor spectra by photography. The two main problems in using video tape meteor spectrum records are: (1) the video tape recording has a much lower resolution than the photographic technique; (2) video tape is relatively new type of data storage in astronomy and the methods of quantitative photometry have not yet been fully developed in the various fields where video tape is used. The use of the most detailed photographic meteor spectra to calibrate the video tape records and to make positive identification of the more prominent chemical elements appearing in the spectra may solve the low resolution problem. Progress in the development of standard photometric techniques for the analysis of video tape records of meteor spectra is reported. E.A.K.

N83-14043*# Herzberg Inst. of Astrophysics, Ottawa (Ontario).
CURRENT TRENDS IN METEOR SPECTROSCOPY Summary Report
Peter M. Millman *In its* Meteors and Meteor Spectra Anal. 30 Sep. 1982 6 p refs (For primary document see N83-14040 04-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The history of progress over more than a century in meteor spectroscopy is summarized. The observational data were originally visual records, but in the beginning of the 20th century photography of meteor spectra was undertaken. In the forties, 60 meteor spectra were photographed. Interest in the upper atmosphere led to the development of more efficient meteor cameras which employ replica gratings, and electronic image intensification systems recordings on video tape which resulted in the availability of several thousand meteor spectra. E.A.K.

N83-14044# Los Alamos Scientific Lab., N. Mex.
COMET HALLEY, PARAMETER STUDY 1
W. F. Huebner and M. M. Fikani Jun. 1982 44 p refs
(Contract W-7405-eng-36)
(DE82-018352; LA-9346-MS) Avail: NTIS HC A03/MF A01

To aid in defining a mission to comet P/Halley, its inner coma is simulation by a computer program that models time dependent chemical reactions in a radially and isentropically expanding gas, taking into account attenuation of solar ultraviolet radiation in the subsolar direction. Column density predictions are based on intelligently selected combinations of poorly known values for nucleus parameters that include size, visual albedo, and infrared emissivity. Only one chemical composition and a minor modification of it are considered here; the dust-to-gas ratio in this model is zero. Although the somewhat optimistically volatile composition chosen here favors a smaller nucleus, a mean nuclear radius of only 0.5 km is unlikely. No significant increase of molecular column density is predicted by this model as a spacecraft approaches, once it is less than a few 10(4) km from the nucleus. Predictions are made for various heliocentric distances of interest for comet missions and for ground observations. DOE

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-14045 Institut d'Aeronomie Spatiale de Belgique, Brussels.
CURRENT SOLAR SPECTRAL IRRADIANCE OBSERVATIONS: A REVIEW
Paul C. Simon 1982 16 p refs Presented at Symp. on the Solar Constant and the Spectral Distribution of Solar Irradiance, Hamburg, 17-18 Aug. 1981
(Aeronomica-Acta-A-244-1982) Copyright. Avail: Issuing Activity

Ultraviolet solar spectral irradiance measurements are reviewed and their divergences are discussed. Deduced variations over the rising phase of solar cycle 21 are presented. Observational needs for climatology and aeronomy are outlined. The H Lyman alpha irradiance value and its variability remain controversial since rocket and satellite data do not agree. Solar irradiance data for a quiet Sun exhibit very large discrepancies, reaching a factor of 2 in the wavelength interval 135 to 175 nm. Irradiance and variability data in the interval 175 to 210 nm are inconsistent.
Author (ESA)

N83-14046# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
SOLAR RADIATION AS A FOREST MANAGEMENT TOOL: A PRIMER AND APPLICATION OF PRINCIPLES
Howard G. Halverson and James L. Smith Apr. 1979 15 p refs (PSW-33) Avail: NTIS HC A02/MF A01

The incident solar radiation received by large land areas cannot be managed or controlled; however, forest management can exert significant effect on local insolation in small areas. Harvest and regeneration patterns can be designed to increase or decrease the radiation level at many sites. The objectives of the management plan can determine the level of insolation desirable. Basic relationships usable to more quantitatively evaluate how solar radiation and shadows can be integrated at specific sites to achieve a management goal are discussed. Some concepts of applied climatology and solar radiation are summarized. An example is included to show how these principles can be used in resource management. A.R.H.

N83-14047*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUBMILLIMETER EXTENSIONS OF THE SOLAR LIMB DETERMINED FROM OBSERVATIONS OF THE TOTAL ECLIPSE OF 1981 JULY 31

C. Lindsey, E. E. Becklin, J. T. Jefferies, F. Q. Orrall, M. W. Werner, and I. Gatley (United Kingdom Infrared Telescope, Hilo, Hawaii) Nov. 1982 19 p refs Submitted for publication Prepared in cooperation with Hawaii Univ., Honolulu
(Contract NASw-3159; Grants NAG2-59; NGL-12-001-011)
(NASA-TM-84306; A-9154; NAS 1.15:84306) Avail: NTIS HC A02/MF A01 CSCL 03B

First results are presented of observations of a lunar occultation of the solar limb made from the Kuiper Airborne Observatory in the 30 micrometr, 50 micrometer, 100 micrometer, and 200 micrometer continuum during the total solar eclipse of 1981 July 31. The solar limb was extended at the longer wavelengths up to 1000 km higher than predicted from smooth plane-parallel chromospheric models. Results at both second and third contact show the infrared limb extensions to be approximately 0'.8, 1'.5, 2'.5 and 3'.0 above the visible limb in the observed bands, respectively. A possible interpretation proposes chromospheric fine structure inhomogeneities of greater density than presently incorporated in models of the middle chromosphere. Author

N83-14048# Bonn Univ. (West Germany). Radioastronomisches Inst.
THE FARADAY ROTATION EXPERIMENT OF THE HELIOS MISSION Final Report, Dec. 1981
Michael K. Bird and Hans Volland Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 146 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-014; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

The Faraday rotation of the linearly polarized carrier signal of the Helios spacecraft was monitored during solar occultations. Variations can be divided into three groups according to their characteristic times: a slowly varying rise or fall due to the quiescent corona, fluctuations of the Faraday rotation about a running mean that tends to intensify at smaller solar distances, and occasional discontinuities in the data that may be associated with the coronal transients seen in white light. This data set, which extends from solar minimum to solar maximum, is consistent with the long time scale variations in the brightness of the inner corona and the polarity of the interplanetary magnetic field. The short time scale phenomena provide first evidence for Alfven wave propagation in the corona and for massive disturbance of the magnetic field in a coronal mass ejection event. Author (ESA)

N83-14049# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-Terrestrial Physics.
SOLAR-GEOPHYSICAL ACTIVITY REPORT FOR 7-24 SEPTEMBER 1977 AND 22 NOVEMBER 1977, PART 1
John A. McKinnon, comp. and J. Virginia Lincoln, comp. Feb. 1982 302 p refs 2 Vol.
(PB82-230541; UAG-83-Pt-1; NOAA-82051008-Pt-1) Avail: NTIS HC A14/MF A01 CSCL 03B

This exhaustive case study of an unusual period of solar terrestrial activity (September and November 1977) is a cooperative international effort. It contains data reports from 116 individuals and groups throughout the world, giving details of the solar activity itself and its consequences in the interplanetary medium and the Earth's vicinity that far exceed those normally exchanged through the World Data Centers. Part I contains the following sections: solar region of September 7-24, 1977; solar radio events; space observations, and cosmic rays. GRA

N83-14050# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-Terrestrial Physics.
SOLAR-GEOPHYSICAL ACTIVITY REPORTS FOR 7-24 SEPTEMBER 1977 AND 22 NOVEMBER 1977, PART 2
John A. McKinnon, comp. and J. Virginia Lincoln, comp. Feb. 1982 281 p refs 2 Vol.
(PB82-230558; UAG-83-Pt-2; NOAA-82051009-Pt-2) Avail: NTIS HC A13/MF A01 CSCL 03B

Data presented cover: ionosphere and geomagnetism of September 7-24, 1977; solar region of November 22, 1977; solar radio events; space observations; cosmic rays; ionosphere; and geomagnetism. An author index is included. GRA

N83-14051# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 450, FEBRUARY 1982. PART 1 (PROMPT REPORTS): DATA FOR JANUARY 1982, DECEMBER 1981 AND LATE DATA
Helen E. Coffey Feb. 1982 156 p
(PB82-220914; SGD-450-Pt-1; NOAA-82040905) Avail: NTIS HC A08/MF A01 CSCL 03B

In addition to an index for 1981-1982, this prompt report provides data for January 1982 on: alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, inferred interplanetary magnetic field polarities, mean solar magnetic field, and Boulder Geomagnetic Substorm Log. It also provides data for December 1981 on: daily solar activity centers, sudden ionospheric disturbances, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices. Late data includes spacecraft observations October 1981, cosmic rays May - November 1981 and geomagnetic indices November 1981. GRA

N83-14052# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 451, MARCH 1982. PART 1 (PROMPT REPORTS): DATA FOR FEBRUARY 1982, JANUARY 1982 AND LATE DATA
Helen E. Coffey Mar. 1982 177 p
(PB82-233784; SGD-451-Pt-1; NOAA-82060301) Avail: NTIS HC A09/MF A01 CSCL 03B

In addition to an index for 1981-1982, this prompt report provides data for February 1982 on: alert periods, daily solar indices, solar flares, solar radio emission, solar wind measurements, inferred interplanetary magnetic field polarities; mean solar magnetic field, spacecraft observations and Boulder Geomagnetic Substorm Log. It also provides data for January 1982 on; daily solar activity centers, sudden ionospheric disturbances, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices. Late data includes solar wind measurements December 1981 - January 1982, cosmic rays May-December 1981, Climax and Huancayo, and Geomagnetic indices December 1981. GRA

N83-14053# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
THE IONIZATION STATE OF THE SOLAR WIND Ph.D. Thesis
Stanley Peter Owocki 1982 291 p refs
(Grant NSF ATM-77-23757)
(PB82-225590; NCAR/CT-66) Avail: NTIS HC A13/MF A01 CSCL 03B

The solar wind ionization state is frozen within a few solar radii of the photosphere, and measurements of the ions at 1 a.u. can therefore potentially yield information about conditions at the base of the coronal expansion. If ions are assumed to flow at a steady, common bulk speed in a plasma with a Maxwellian electron distribution, the interplanetary ionization state is characteristic of the electron distribution, the implanetary ionization state is characteristic of the electron temperature in the coronal 'freezing-in' region. In this thesis, we examine the effect of relaxation on one or more of these assumptions. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-14054 Washington Univ., St. Louis, Mo.
HIGH RESOLUTION STUDIES OF THE ELEMENTS SULFUR TO

NICKEL IN THE COSMIC RADIATION Ph.D. Thesis
James Hewitt Crane 1982 150 p
Avail: Univ. Microfilms Order No. DA8223773

In order to measure the individual elemental composition and energy spectra of elements with Z > or = 14, the 6.6 sq m ster cosmic ray detector system composed of two identical 3.3 sq m ster detectors was modified. The high altitude balloon flight exposed this detector to the cosmic radiation near the top of the atmosphere is discussed. The dE/dX versus C method of charge and energy assignment is used. The rate of energy loss (dE/dX) is measured by four layers of pulse ionization chambers and the Cherenkov signal is measured by a Pilot 425 Cherenkov counter. Using these measurements charge to cosmic ray elements above magnesium (Z = 12) over the energy range 400-1200 MeV/n was assigned. An energy spectrum for Fe (600-2500 MeV/n) at the top of the atmosphere from an Fe energy spectrum measured at 6 g sq cm residual atmosphere was derived. Dissert. Abstr.

N83-14055 Iowa State Univ. of Science and Technology, Ames.
ULTRA HIGH ENERGY GAMMA RAYS FROM CYGNUS X-3, PART 1. PROPERTIES OF THE GALACTIC GAMMA RAY SOURCE POPULATION, PART 2 Ph.D. Thesis
Christopher Paul Godfrey 1982 101 p
Avail: Univ. Microfilms Order No. DA8224218

The detection of gamma rays with energies greater than 500 GeV from the variable X-ray source Cygnus X-3 is reported. The gamma ray emission is modulated at the same 4.8 hour period as the X-ray emission and the peak in the gamma ray light curve is in phase with the X-ray maximum. The gamma ray signal above 500 GeV is found to be 10.0 + or - 2.5% of the cosmic ray background, corresponding to a flux of 8 hundred billionth photons/sq cm sec averaged over the cycle. The galactocentric distribution of gamma ray emissivity is derived from the galactic longitude flux profile of 70 MeV to 5 GeV gamma rays as seen by the COS-B satellite. With the assumption that the gamma ray sources are distributed like the total emissivity, it is found that 30% of the total emission is contributed by the discrete sources. This result is independent of the luminosity function of the source population. Dissert. Abstr.

N83-14056*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPRETATION OF COSMIC RAY COMPOSITION: THE PATHLENGTH DISTRIBUTION
R. J. Protheroe, J. F. Ormes, and G. M. Comstock (Cosmo-Science Associates) Jan. 1981 37 p refs Previously announced in IAA as A81-43868
(NASA-TM-82070; NAS 1.15:82070) Avail: NTIS HC A03/MF A01 CSCL 03B

For abstract see A81-43868.

N83-14057*# California Univ., Livermore. Lawrence Livermore Lab.
ON THE NATURE OF 2 GAMMA BURSTS WITH SPECTRAL EVOLUTIONS OBSERVED BY THE KONUS EXPERIMENT
E. P. Liang Stanford, Calif. Stanford Univ. Oct. 1982 15 p refs
(Grant NGR-05-020-668; Contract W-7405-eng-48)
(NASA-CR-169562; NAS 1.26:169562; SU-SUIPR-944) Avail: NTIS HC A02/MF A01 CSCL 03B

Several unique features of the evolving spectra of the April 2, 1979B, and November 11, 1979 gamma-ray bursts observed by the Konus experiment can be used to determine a number of critical parameters of the sources, within the context of the thermal synchrotron model, including their luminosity distance. These results shed much light on the origin of these events and possibly gamma bursts in general. Author

N83-14058*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ANALYSES OF THE KONUS CATALOGUE OF GAMMA-RAY BURSTS WITH THE THERMAL SYNCHROTRON MODEL
E. P. Liang (California Univ., Lawrence Livermore Lab.), T. Jernigan, and R. Rodrigues (Stanford Univ.) Sep. 1982 47 p refs
(Grant NGR-05-020-668; Contract W-7405-eng-48)
(NASA-TM-85148; NAS 1.15:85148; SU-SUIPR-943) Avail: NTIS HC A03/MF A01 CSCL 03B

Approximately 150 reported gamma bursts of the Konus catalogue using the thermal synchrotron model are analyzed. An overwhelming majority of these spectra can be satsifactorily fitted by theoretical thermal synchrotron spectra of mildly relativistic electrons in strong magnetic fields, making the strong-field neutron star picture at least self-consistent. Valuable additional information is also extracted from various spectral features contained in many of the events. B.W.

N83-14059# Stanford Univ., Calif. Institute for Plasma Research.
STRUCTURE OF THE HELIOSPHERIC CURRENT SHEET IN THE EARLY PORTION OF SUNSPOT CYCLE 21
J. Todd Hoeksema, John M. Wilcox, and Philip H. Scherrer Apr. 1982 47 p refs
(Contract N00014-76-C-0207)
(AD-A119352; SU-IPR-924) Avail: NTIS HC A03/MF A01 CSCL 03/2

The structure of the heliospheric current sheet on a spherical source surface of radius 2.35 R has been computed using a potential field model during the first year and a half after the last sunspot minimum. The solar polar magnetic field that is not fully observed in conventional magnetograph scans was included in the computation. The computed heliospheric current sheet had a quasi-stationary structure consisting of two northward and two southward maxima in latitude per solar rotation. The extent in latitude slowly increased from about 15 degrees near the start of the interval to about 45 degrees near the end of the interval. The magnetic field polarity (away from the Sun or toward the Sun) at the subterrestrial latitude on the source surface agreed with the interplanetary magnetic field polarity observed or inferred at Earth on 82% of the days. The interplanetary field structure observed at Earth at this time is finely tuned to the structure of low-latitude fields on the source surface. Author (GRA)

99 GENERAL

N83-14060# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN, TECHNICAL PROGRAMME, 1983
Aug. 1982 34 p
(AGARD-BULL-82/2) Avail: NTIS HC A03/MF A01

Aerospace medicine, avionics, electromagnetic wave propagation, flight mechanics, fluid dynamics, guidance and control, propulsion and energetics, structures and materials, and technical information comprise the program activities. A calendar of meetings, consultants and lecture series, military committee studies, and budget and publications summaries are included. N.W.

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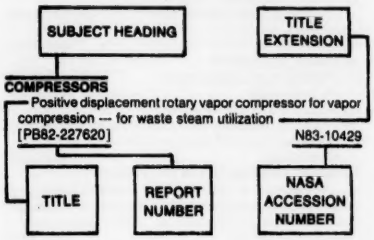

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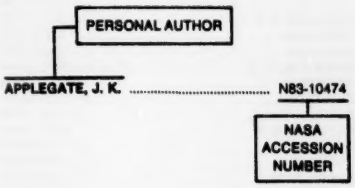

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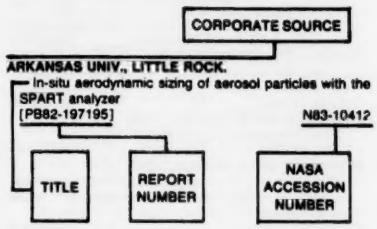

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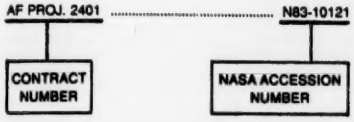

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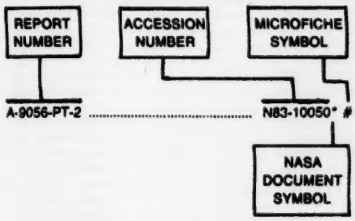

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MC-TW-223/82 ..... N83-13895 #

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NCAR/AR-81 N83-13770 #

NCAR/CT-66 N83-14053 #

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NE/VIND-81/4 N83-13372 #

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NSF/MEA-82001 N83-13317 #

NSSDC/WDC-A-R/S-82-23 N83-13132* #

NSSRP-32 N83-13963 #

NSTB-AAR-82-4 N83-13082 #

NTIA/CR-82/17 N83-13352 #
NTIA/CR-82/18 N83-13353 #
NTIA/CR-82/19 N83-13810 #

NTIA/REPT-82-98 N83-14019 #
NTIA/REPT-82-100 N83-13351 #

NUSC-TR-6761 N83-13874 #

ORESU-T-81-002 N83-13777 #

ORNL-5857 N83-13236 #
ORNL-5904 N83-13646 #

ORNL/CSD-103 N83-13875 #

ORNL/TM-7356-PT-1 N83-13999 #
ORNL/TM-8244 N83-13995 #
ORNL/TM-8316 N83-13994 #
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OSURF-760931/710709 N83-13233* #

OTA-E-186 N83-13270 #

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OTA-STI-178 N83-13131 #

OWRT-(1656(1) N83-13213 #

OWRT-A-043-WVA(1) N83-13660 #
OWRT-A-055-PA(1) N83-13663 #
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PB82-182791 N83-14035 #
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PNR-90120 ..... N83-13107 #
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PR-731 ..... N83-14037

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RADC-TR-82-189 ..... N83-13354 #

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RL-82-022 ..... N83-14008 #
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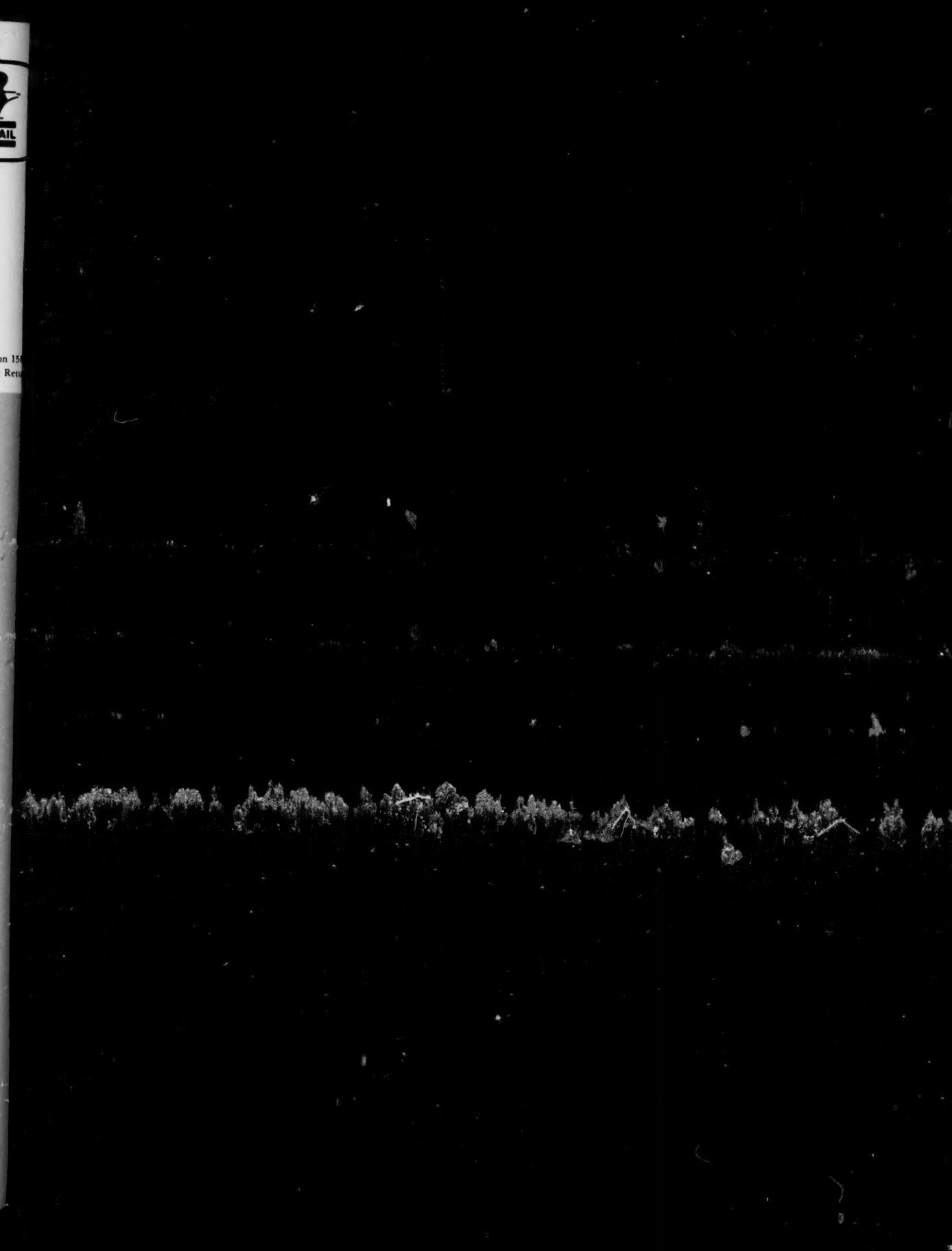
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